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Economics

FUTURE PROOFING MOBILE GAME ADVERTISING INVENTORY

How mobile game companies can mitigate advertising revenue losses resulting from a
tightening privacy landscape

Information systems science
Master's thesis

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Along with the smartphone revolution, mobile gaming industry has grown rapidly. Currently most mobile games are free to download from a smart device's own application store. This has been made possible by shifting the monetization of users from the purchase required to download the app, to in-app purchases and showing advertising within the game. Currently mobile game advertising revenues are over a hundred billion USD annually, and this monetization method allows mobile game companies to financially benefit from their game while keeping it free for the users.

Mobile game advertising has gone through significant privacy changes within the past years. Operating system side privacy initiatives like Apple's App Tracking Transparency (ATT) framework and legal privacy requirements like IAB's Transparency & Consent Framework (TCF) have restricted player data sharing to third parties. A vital part of this player data are device identifiers, which advertisers use for targeting advertising. These signal losses have made it increasingly hard for advertisers to target players, which has negatively affected their willingness to pay for impressions. With Google also having planned their Android Privacy Sandbox initiative for years, the digital advertising industry is preparing for additional signal losses, which are expected to further decrease impression prices, and thus decreasing advertising inventory value for mobile game companies.

This thesis aims to find solutions, which mobile game publishers could use to mitigate these advertising revenue losses, while remaining compliant with the required privacy restrictions. A key enabler for this is first-party data that mobile game companies can directly collect from their players and can be used in a privacy compliant way for advertising targeting. This thesis examines the different parties involved within the mobile game advertising ecosystem, and how the mobile gaming industry together with the advertising industry could unlock additional value for both mobile game companies through higher impression prices, and advertisers through better targeting methods.

Key words: Mobile game advertising, Data privacy, First-party data

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Älypuhelimien vallankumouksen myötä mobiilipeliteollisuus on kasvanut nopeasti. Nykyään suurin osa mobiilipeleistä ovat ilmaiseksi ladattavissa äylaitteen omasta sovelluskaupasta. Tämän on mahdollistanut rahan liikkumisen siirtyminen pelien lataushetkillä tapahtuvista ostoista pelinsisäisiksi ostoiksi ja mainosten näyttämiseksi peleissä. Tällä hetkellä mobiilipelien sisäisen mainonnan arvo on yli sata miljardia Yhdysvaltain dollaria vuodessa. Tämä kaupallistamiskeino mahdollistaa mobiilipeliyhtiöiden tehdä voittoa peleistään pelin ollessa ilmainen käyttäjille.

Mobiilipelimainonta on läpikäynyt huomattavia yksityisyyteen liittyviä muutoksia viime vuosien aikana. Käyttöjärjestelmäpuolen yksityisyysaloitteet, kuten Applen App Tracking Transparency (ATT) -viitekehys ja lainsäädännölliset vaatimukset, kuten IAB:n Transparency & Control Framework (TCF) -viitekehys ovat rajoittaneet pelaajadatan jakamista kolmansille osapuolille. Tärkeä osa tätä pelaajadataa ovat laitetunnisteet, joita mainostajat käyttävät mainonnan kohdentamiseen. Näiden signaalien menetykset ovat heikentäneet entisestään mainostajien kykyä kohdentaa mainoksia pelaajille, mikä on vaikuttanut negatiivisesti mainostajien haluun maksaa mainosten näyttökerroista. Lisäksi Googlen olleen suunnittelemassa Android Privacy Sandbox aloitetta vuosia, digimainonnan toimialalla valmistaudutaan lisääntyviin signaalien menetyksiin, joiden oletetaan laskevan mainosten näyttökertojen hintoja entisestään, ja täten alentavan myös mobiilipeliyhtiöiden mainosinventaarion arvoa.

Tämä opinnäytetyö pyrkii löytämään keinoja, joiden avulla mobiilipeliyhtiöt voivat lievittää mainosinventaarion arvon menetyksiä, samalla noudattaessaan yksityisyyteen liittyviä rajoituksia. Tärkeimpänä mahdollistajana on ensimmäisen osapuolen data, jota mobiilipeliyhtiöt voivat kerätä suoraan käyttäjiltään, ja käyttää sitä yksityisyysvaatimuksia noudattaen mainonnan kohdentamiseen. Opinnäytetyössä tutkitaan eri osapuolia, jotka liittyvät mobiilipelimainonnan ekosysteemiin, ja kuinka mobiilipeliteollisuus voi yhdessä mainosteollisuuden kanssa saada lisäarvoa mobiilipeliyhtiöille korkeampien mainosten näyttökertojen hintojen kautta, ja mainostajille parempien kohdennuskeinojen kautta.

Avainsanat: Mobiilipelimainonta, tietosuoja, ensimmäisen osapuolen data

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Glossary

ATT – App Tracking Transparency, a privacy initiative by Apple that restricts the availability of device identifiers on iOS devices.

TCF – Transparency & Consent Framework, an EU-level privacy framework for publishers and advertisers to comply with GDPR.

CMP – Consent Management Platform, a digital platform used to store user's consent choices.

GDPR – General Data Protection Regulation, legislation which defines how companies can collect and process personal data.

IDFA – Identifier for Advertisers, a device-level identifier on iOS devices. Often used for targeting advertising.

GAID – Google Advertising Identifier, a device-level identifier on Android devices. Often used for targeting advertising.

Programmatic advertising – A form of digital advertising, where computers automatically handle transactions between advertising supply and demand.

RTB – Real-Time Bidding, a method of programmatic advertising serving where individual impressions are auctioned for multiple demand sources simultaneously.

Waterfall ad serving – A legacy method of programmatic advertising serving where impressions are sold in a predetermined order of descending price.

SSP – Supply Side Platform, a party that sells advertising inventory

DSP – Demand Side Platform, a party that purchases advertising inventory

(e)CPM – (effective) Cost Per Mille, industry standard price metric for thousand ad impressions.

CTR – Click-Through Rate, share of clicks to impressions (clicks / impressions).

CVR – Conversion Rate, share of conversions to impressions (conversions / impressions).

First-party data – Data collected by a company through direct interaction with a customer or user.

Third-party data – Data collected outside direct interaction with a customer or user.

UA – User Acquisition, process of getting new users for an application.

PII – Personally Identifiable Information, a term used for persistent user identifiers often used for tracking.

ROAS – Return on advertising spend.

IAP – In-App Purchase, a transaction where a user uses real money in an application

IAA – In-App Advertising, advertising that occurs within an application

1 Introduction

Over the last decade mobile gaming has become a massive industry worldwide. According to Statista (2023) mobile game revenues account for more than half of all gaming revenues. A large portion of these mobile game revenues are games advertising revenues, which Statista (2023) expects to increase to 130.9 billion USD in 2025.

Games advertising is a form of digital advertising, where players are shown advertisements within the game to generate revenue from them. It's a field that has gone through plenty of significant changes in the past decade in terms of technology and regulation. More changes to digital advertising are expected to take place, especially related to data privacy. The most impactful example of which is the upcoming Android Privacy Sandbox. (Long, 2022; Google, 2024) These constant changes have a major effect on how companies can do targeted advertising, which is a core component of digital advertising in the modern day. Targeted advertising is advertising, where data collected from the advertisement's recipient is used to decide which ad to show them. (Urban et al., 2020; Bashir et al., 2016) Accuracy of targeting for ads ranges from low levels of targeting, which could be showing country-specific ads according to the recipient's location, to high levels of targeting, which can include showing ads according to the ad recipient's purchase history and browsing tendencies, if this data is available for advertisers.

Targeted advertising is extremely popular due to higher performance compared to non-targeted ads. The companies that have more data on their ad recipients can optimize click-through rates and conversion rates. (Shah & Nasnodkar, 2021) Better click-through rates and conversion rates also result in companies' willingness to pay higher prices to show ads to specific recipients. (Olejnik & Castelluccia, 2016)

However, with data privacy regulations and standards, such as the upcoming Android Privacy Sandbox, the privacy landscape is expected to become even more strict. Because of these changes, targeted advertising is expected to become more difficult as well. (Long, 2022) When advertisers are either unable to collect data or take advantage of it, there's less reason for advertisers to bid higher prices for impressions. (Olejnik & Castelluccia, 2016) In addition to advertisers having less data to match with information given within an ad request due to stricter data sharing, ad requests are to also become less robust in terms of data due to data privacy regulation and standards.

Decreasing amounts of data being available for targeting purposes may be disadvantageous for advertisers, but parties selling ad inventory are financially suffering from this as well. (Kraft et al.,

2023, Laub et al., 2023) Since individual impressions become cheaper due to tightening data privacy regulation and standards, the overall ad inventory value in mobile games drops significantly. A case example of this is the privacy initiative Apple rolled out in 2021 related to tracking possibilities, that affected advertising heavily. This initiative is called App Tracking Transparency (ATT), which made the availability of identifiers much scarcer for advertisers. The initiative reduced the rate of trackable traffic coming from Apple devices from 73% to 18% in the USA. This decrease in trackable traffic decreased the revenue for publishers from Apple users by 21%. (Kraft et al., 2023) Since a large part of mobile game monetization is done through advertising, tightening data privacy regulation and standards decrease the revenue mobile game companies can gather through selling their ad inventory.

The upcoming Android Privacy Sandbox is expected to be published soon on Android devices and to work in many ways similarly to Apple's ATT, where users are prompted whether they want to allow apps to track them or not. (Seufert, 2022) With the upcoming changes on Android as well, the number of players that opt out of tracking is expected to become greater than earlier.

Due to publisher revenue losses resulting from less data being available for advertisers, the importance of first-party data is emphasized. Since data privacy regulation and standards have a strong focus on data sharing across companies, third-party data is most affected. However, first-party data, which is data that companies collect from direct interaction with their customers (Latvala et al., 2022) is less affected due to this type of data not exchanging ownership. There is plenty of literature and research related to the use of first-party data due to its importance and business potential, especially in the future. (Binns & Bietti, 2020; Çınar & Ateş, 2022; Ham & Lee, 2025; Latvala et al., 2022; Long, 2022) When collecting data through third-party sources becomes increasingly difficult, the companies with rich first-party data will be in a strong position, given that this data is used efficiently. (Latvala et al., 2022)

Advertising is only one of many ways to utilize first-party data, but for mobile gaming, where a great share of the total revenue comes from ad monetization, there is significant business potential. Whereas the use of first-party data for advertising has been researched to some degree, there is a research gap in literature that considers the topic from a mobile game viewpoint. Mobile game advertising differs from other digital advertising due to a different context, which is why it's not clear whether mobile game companies could use the same advertising methods as other publishers in the future. Due to this research gap, there's value in researching how mobile game companies

could collect and utilize their first-party data for higher advertising prices, while complying with increasing privacy requirements.

A key question regarding the use of first-party data for mobile game companies' advertising purposes is, in what ways could it be utilized. If a mobile game company collects data from players that opt out of tracking, how could information derived from that data be communicated with potential ad inventory buyers without breaching data privacy legislation or standards? There is further lack of information regarding topics that are closely related as well, such as what kind of data buyers would find insightful for their purchase decisions, and how mobile game companies could get such data, considering that interaction between players and the company occurs only through a mobile game application interface.

Tightening privacy landscape and decreasing advertising targeting possibilities are topics that the mobile game advertising industry has been forced to look at for years already, but very scarce scientific literature has been written of these topics from a mobile game standpoint. Most information regarding this topic can be found from industry blogs, podcasts and videos, but not from many scientific peer reviewed sources. This research is conducted due to this gap in scientific literature regarding the topic. The thesis aims to contribute to both the mobile gaming advertising industry and the scientific body of knowledge. Contributions to the mobile gaming advertising industry is done by producing an actionable framework for turning first-party data collected from players that opt out of tracking into higher impression values. This framework aims to explain how mobile game companies can future proof the revenue produced by their ad inventory, while remaining data privacy compliant in a world of constantly tightening privacy legislation and standards. Contributions to the scientific body of knowledge are made by creating a comprehensive overview of existing literature and combining it with empiric information from within the mobile game advertising industry.

Given the background presented in the introduction, the privacy changes within the advertising technology industry are much less a question of if, and more of a question of when. With the ongoing tightening privacy changes, how ad inventory value can be preserved is a billion-dollar question for ad inventory publishers.

The research questions can be split into the following main research question and two sub-questions.

Main research question: How can mobile game companies maximize ad impression values for players that opt out of tracking, while being privacy compliant?

Research sub-question 1: How can mobile game companies collect and utilize first-party data for advertising purposes?

Research sub-question 2: What privacy compliant solutions are expected to be used in the future in mobile game advertising?

Next in chapters 2 and 3, a theoretical background is created in order to examine the multifaceted ecosystem related to the topic. Chapter 2 includes topics related to digital advertising, such as advertising technology, targeted advertising, mobile game data collection and mobile game advertising. Chapter 3 looks at data privacy, which includes different privacy legislations, frameworks and standards, as well as advertising solutions that are compliant with them. Chapter 4 will examine the methodology of the research as well as elaborate on the research conduction, including the interviews and data analysis. Chapter 5 aims to create an artefact based on the results and information derived from existing research literature, as well as empiric data collection. In chapter 6 the artefact is evaluated, and corrections are made to create the final artefact. Chapter 7 includes conclusions and reflections on the results.

2 Digital advertising

Digital advertising is a broad term for all advertising that involves computational networks (McStay, 2017). This can include anything from digital billboards on a bus stop to an influencer posting promotional content via social media, as well as mobile games showing advertisements to players. According to Statista (2024), digital advertising accounted for 67.2 % of global advertising revenue in 2022. The majority of digital advertising is shown directly on the recipient's device (eMarketer, 2019), whether it's display ads on the sides of a website or video ads when scrolling through social media. This context of concurrent digital advertising makes it possible for advertisers to either target specific audiences or even reach individual users and target them with specific ads – given that the advertiser has enough data to pinpoint the user. (Busch, 2015) Since the range of digital advertising is broad and mostly unrelated to mobile games, this research focuses on programmatic advertising which is the technology used to show advertisements in most cases of mobile games advertising.

2.1 Programmatic advertising

Programmatic advertising refers to advertising, where ads are sold and bought automatically using machines and data. (Busch, 2015) It is a form of digital advertising, that builds the basis for most advertising we see today (eMarketer, 2019). In programmatic advertising algorithms are prepared for ad serving, and through this, publishers can set up their ad inventory to be offered to different demand sources according to different rules, without a human being present during the ad serving process. Programmatic advertising includes multiple different serving methods, such as programmatic direct, waterfall ad serving, real-time bidding (RTB) and private marketplaces. (Busch, 2015)

Whereas all these methods have similarities, such as automatization, tools and purposes, this research looks at auction methods where recipient data is sent in real-time, and through which purchase decisions are made on the buyer's side. These methods mainly include RTB, and a more legacy ad serving technology - waterfall ad serving.

Real-Time Bidding (RTB) is an ad serving technology within digital advertising, which is characterized by the ability to bid for and purchase advertising inventory in real-time, ability to bid for and purchase individual impressions, as well as purchasing occurring within an auction where different demand sources can simultaneously bid for inventory as presented in Figure 1. (Busch,

2015) RTB is a system that currently allows high accuracy in targeting for advertisers through them being able to match ad recipient's data with existing data points. (Veale & Borgesius, 2022)

RTB works through a publisher announcing that they have an ad placement available for auction. The publisher, commonly through a Supply Side Platform (SSP), sends an ad request, which is sent to a mediation platform where advertisers, directly or through Demand-Side Platforms (DSP) can bid for the impression in question. (Busch, 2015)

Within the ad request are various data points about the context of the ad impressions, as well as possible information on the recipient. Such data points include but aren't limited to the website or app the ad will be shown in, the resolution of the placement, country of ad recipient, device the ad recipient uses and possible identifiers, such as cookies for browsers or mobile device identifiers, such as IDFA for Apple or GAID for Android. (Adikari & Dutta, 2015, Latvala et al., 2022) The bid requests are generally sent in a JavaScript Object Notation (JSON) format, which is a lightweight data format, which is commonly used for sending and storing data. (Alaimo & Kallinikos, 2018)

Using the data points given within an ad request, the potential buyer, also known as the bidder, attempts to evaluate the value of the impression. This can be done in a way that utilizes pre-existing data on the bidder's side. (Busch, 2015) The bidders may attempt to match the cookies or identifiers within the request with pre-existing information and user profiles, or if cookies or identifiers aren't available, they may attempt to evaluate the impression value using user groups that have similar contextual characteristics, such as country or device combinations. Once the bidders have made their best estimate on the value of the impression, they will bid according to it. (Adikari & Dutta, 2015)

This same evaluation process is done by multiple potential buyers. After their bids are sent and received by the mediation platform, the highest bid wins the impression. Within the bid is included a tag or URL, through which the ad creative is loaded for the advertisement in question. After this bidding process, the ad recipient may see the ad on the platform they are using. This entire process, all the way from sending the ad request to evaluating the bid amount, is done fully programmatically within milliseconds. (Busch, 2015)

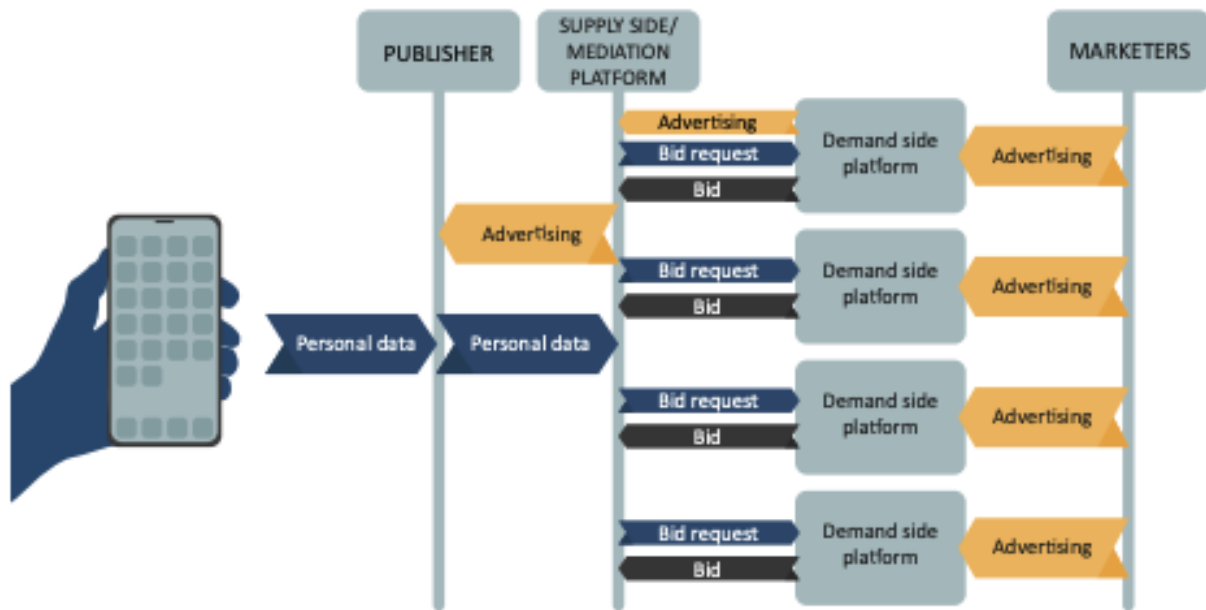


Figure 1 Programmatic advertising (Busch, 2015)

Related to RTB, the most widespread technical industry standard is the OpenRTB standard, which is widely used within mobile advertising (IAB, 2025). OpenRTB isn't exactly a legal requirement or a platform requirement, but an industry standard, which many actors in the ecosystem comply with and require. The OpenRTB standard doesn't pose many restrictions per se but requires standardized methods of sending data between parties. (IAB, 2025) For example, the OpenRTB protocol states which fields should be sent within bid requests, and what type of information these fields should include (see figure 2). These fields include all the data that bidders receive regarding the impression, according to which they value their bids. (IAB, 2025; Busch, 2015)

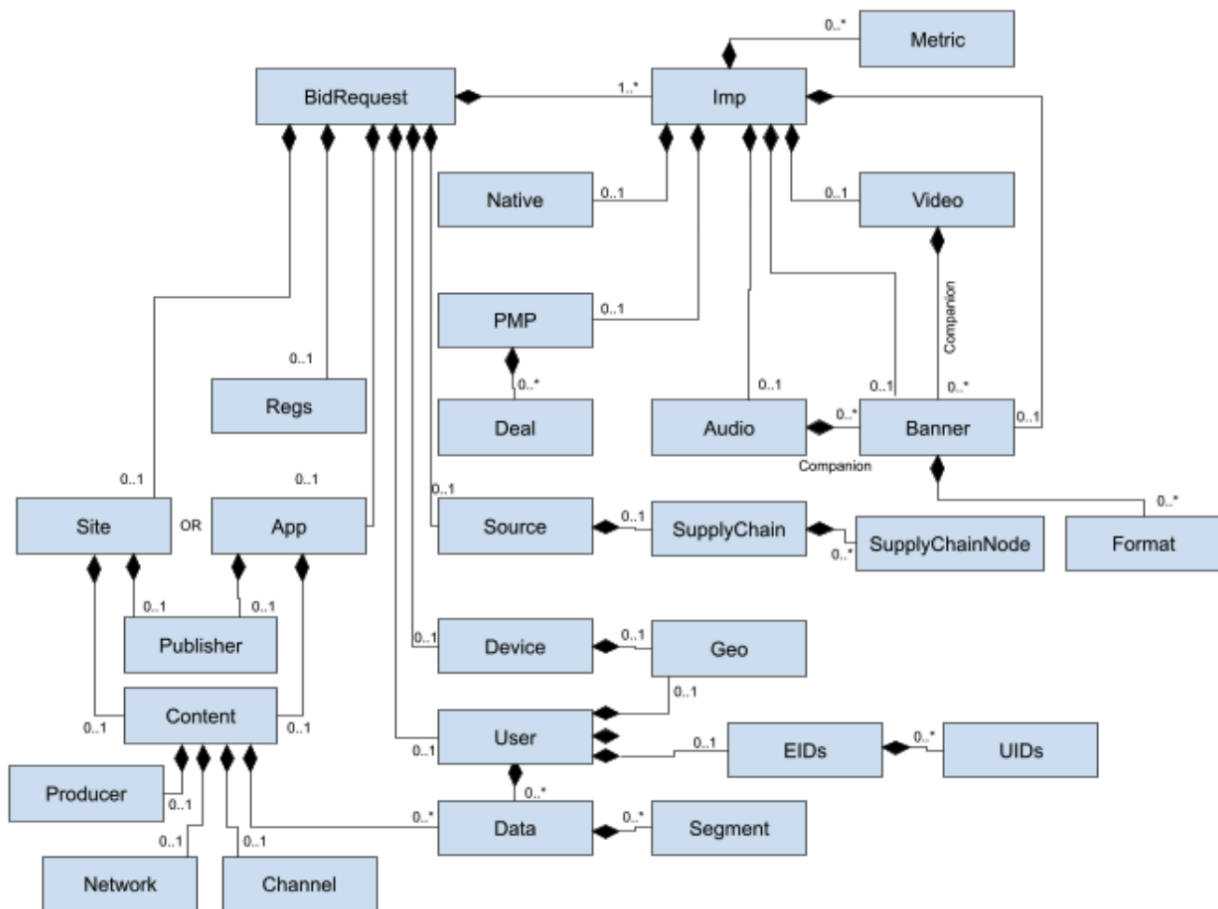


Figure 2 Bid Request information within the OpenRTB framework (IAB, 2025)

Waterfall ad serving is in many ways a similar technology to RTB. However, the main difference between the two is that waterfall advertising technology goes through each demand source sequentially instead of simultaneously. (Pachilakis et al., 2019) Waterfall feeds are generally set up by price point, and the advertising system goes through this list of price points by descending price, a bit like an actual waterfall. Waterfall advertising is significantly slower and heavier to run than RTB, which is why the advertising industry has largely moved away from it. (Pachilakis et al., 2019) However, waterfall advertising still exists and is used, which is why this thesis also includes waterfall advertising for considering solutions.

Advertisers through both RTB and waterfall ad serving utilize a wide variety of data points to show advertisements to desired users with certain characteristics. (Busch, 2015) Since the data being sent in the auctions in both advertising serving technologies is a key factor in advertisers' success, the

following chapter focuses on what types of data are used to target advertising, how this targeting is done, and what effects targeting advertising has on advertising revenues.

2.2 Targeted advertising

Targeted advertising refers to advertising where the decision to show ads to a recipient is made according to the data the buyer has on the recipient. Ullah and others (2023) define it as “collecting data about an individual’s online and physical presence to serve him/her appropriate advertising content”. Targeted advertising has great benefits compared to non-targeted advertising. Targeted advertising allows advertising to people at different points of a marketing funnel (Busch, 2015), retargeting (Bashir et al., 2016), higher click-through rates (CTR) (Rafieian & Yoganarasimhan, 2021), higher conversion rates (CVR) (Farahat & Bailey, 2012), higher cost effectiveness of advertising (Farahat & Bailey, 2012) and the ability to target certain target audiences with a high accuracy (Speicher et al., 2018). Targeted advertising has long been an industry standard within online advertising due to the several benefits mentioned. Targeted advertising also offers publishers increased revenue, since advertisers are often willing to pay higher prices for targeted impressions. (Laub et al., 2023)

Targeting advertising can be done using behavioral or contextual data. Contextual data describes the environment in which the user is seeing the ad. Contextual data includes time, location, device, application or website, and specifications of the ad placement itself, such as resolution. Contextual data is also considered more privacy preserving, because it includes information that is harder to pinpoint to specific users than behavioral information. (Bleier, 2021) There are grey areas between contextual and behavioral data too. As an example, data about gameplay might be both, since it may reveal the environment of the player, such as level number, while also giving insights to what type of behavior a has shown to reach it. These grey areas can be seen to result from a lack of exact definitions for the data types. As an example, the definition for contextual data is sometimes described as “not behavioral”. (Bleier, 2021) Also, even though contextual data is considered more privacy preserving, with more contextual data points, probabilistic tracking also becomes more efficient. (Kurtz et al., 2016)

Behavioral data includes information on user activity. Examples include browsing tendencies or spending habits. Behavioral data often includes data points that are much more user-specific than contextual data, which is partially why targeting done with behavioral data is considered more privacy intrusive. Behavioral targeting for advertisements tends to generate a larger revenue surplus for advertisers than contextual targeting. (Rafieian & Yoganarasimhan, 2021) Behavioral data

collection over time is called user tracking, and since targeted advertising is often done through tracking users (Koch et al., 2022), there are data privacy concerns related to targeted advertising as a method of advertising. Since both contextual and behavioral data can be used for advertising purposes, including targeting advertising, both data types are examined in this theoretical background.

There are grounds to claim that targeted advertising benefits all parties involved, including the person who prefers seeing ads that are tailored according to their topics of interest (De Keyzer et al., 2015), the publisher that gains higher revenue from showing the targeted ad in their inventory (Laub et al., 2023) and the advertiser that gets higher returns on their ad investments (Farahat & Bailey, 2012). However, despite the mentioned benefits, there's also widespread criticism regarding targeted advertising.

Nill and Aalberts (2014) consider there to be legal and ethical challenges related to targeted advertising. The legal challenges include, whether companies are operating transparently and giving consumers full disclosure of their data use, using and storing their data securely and storing it for a limited time, using consumers' data only for the purpose that it's collected for and has been consented to. The ethical challenges include difficulty or inability to prevent targeted advertising, as well as people being unaware that this type of targeting is taking place. The Irish Council for Civil Liberties (2022) highlights that the data used for targeting advertising is often sensitive, and that it's being shared to countless parties within the advertising ecosystem. Also, since this sensitive, personal data be traced to the ad recipient makes targeted advertising a privacy risk that allows advertisers to exploit the advertisements' recipients.

There are several methods for targeting advertising. Such methods include but aren't limited to cookies, fingerprinting and device identifiers. (Laub et al., 2023) There are also different targeting practices between different advertisers. Some advertisers may bid on extremely accurate data on their ad recipients through cookies or user IDs, as well as accurate behavioural data, such as browsing history and some advertisers may be content with much less granular targeting, such as knowing the country and device of the user. Mobile applications don't utilize cookies like browsers, which makes device identifiers and probabilistic tracking like fingerprinting the main ways to target specific users on mobile. (Ullah et al., 2023) Probabilistic targeting relies on sophisticated estimates for reaching individual users. Essentially it uses a model that attempts to match different data points within the ad request with prior ad recipients with as high an accuracy as possible, so that they could advertise to them. As an example, retargeting is considered a valuable method of advertising,

which relies on knowing who has been shown advertisements already. (Rafieian & Yoganarasimhan, 2021) With accurate probabilistic models, retargeting can be attempted with a limited certainty even while having no personally identifiable information (PII) or device identifier available for the ad recipient.

The use of different identifiers is a common way of doing targeted advertising on mobile devices. If required consent is given, different identifiers are shared within an ad request. The main identifiers used for targeting in mobile apps are the Identifier For Advertisers (IDFA) on iOS devices and the Google Advertising ID (GAID) on Android devices. (Guida, 2021) These identifiers are set on a device level, meaning they are assigned to a single device. Different applications and services have access to this identifier, which means they can also collect different data points and tie them to an identifier. (Apple, n.d., Google, n.d.) These applications and services are then also able to target advertising to this identifier, even within different applications, as long as the identifier is available in the ad request. (Ullah et al., 2023) User targeting is a significant enabler of consumer centric advertising, since bidders have better information on the recipients of the advertisements. (Busch, 2015)

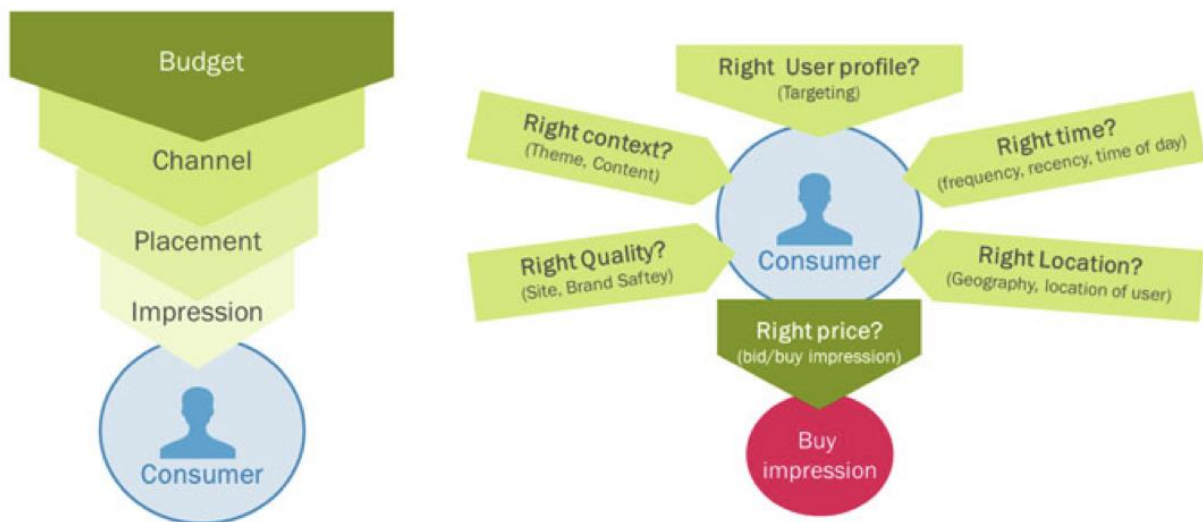


Figure 3 Traditional media planning and consumer centric advertising (Busch, 2015)

The availability of identifiers is tied to how high advertisers bid for users. According to Laub and others (2023), when user identifiers are unavailable, prices decrease within the auction event. In the European Union this drop was between 18 and 23 per cent, whereas in the United States this drop was 47 per cent.

The reason why the digital advertising industry is actively looking for alternatives for these identifiers is that these identifiers are expected to become increasingly rare due to privacy changes. As we saw in 2021 with Apple and ATT, the rate of users that consented to sharing their IDFA with applications dropped heavily due to the initiative. Something similar has been long expected to take place on Android as well. For years, Google has claimed they are going to go live with Google Privacy Sandbox soon. The Privacy Sandbox on Android is described in the following way on Google's website: "Our goal with the Privacy Sandbox on Android is to develop effective and privacy enhancing advertising solutions, where users know their privacy is protected, and developers and businesses have the tools to succeed on mobile." (Google, 2024) Due to the clear communication from Google that it's planning on implementing a privacy-first solution on Android devices, the digital advertising industry is trying to find alternative and future proof ways to do targeted advertising.

In order to answer the research question, in addition to understanding the advertising ecosystem, we must also understand how mobile games operate, and how advertising is implemented within them. As previously stated, mobile games are major advertising publishers with great advertising revenues (Statista, 2023). The following chapter will examine how advertising is implemented in mobile games, and how mobile games' data collection and sharing enable targeted advertising in mobile games. Also, motivations of users, mobile game publishers, and advertisers are taken into consideration.

2.3 Mobile game advertising

Mobile games are generally defined as games played on smart devices, such as smartphones or tablets. (Yamaguchi et al., 2017) Generally these games are downloaded from devices' application stores, such as Google Play on Android devices, and App Store on iOS devices. On both Google Play and App Store, the vast majority of top grossing games are free to download. (Similarweb, n.d.) The top grossing games that are free to download use different monetization methods, such as freemium, where the game itself is free but monetizes users through in-app purchases (IAP), in-app advertising (IAA), where users are monetized by showing them ads, or hybrid monetization, where games include both IAPs and IAAs for monetization. (Tang, 2016) In this research, the term IAA is also used to represent advertising monetization in hybrid games as well. Whereas IAA refers to all advertising done in applications, mobile game advertising refers to advertising done in mobile games and is used in this research to distinguish mobile game specific advertising from IAA.

Since mobile games are generally applications used on mobile devices, mobile game advertising shares much resemblance to the broader concept of IAA. Mobile game advertising, however, often uses different types of advertising placements and formats (SocialPeta & TopOn, 2020). The main ad formats in mobile games are rewarded videos, where players are rewarded with in-game items or progress for watching an ad (see figure 4), interstitial ads, where players are forced to watch an advertisement in a transition phase in the game, or banner ads, which are commonly located on the sides of the screen. (Unity Technologies, n.d.) To tie the business model of mobile game advertising to the broader context of digital advertising, mobile game companies that monetize their games through ads are publishers and sell their inventory to SSP's and mediation platforms, or possibly directly to DSP's and advertisers. (Busch, 2015)



Figure 4 Incentivized video ad entry point in Rovio's Angry Birds 2. Own image

According to IAB's Changing the Game -report (2024), mobile game advertising is a trending method of advertising, and it's considered effective in reaching audiences that are valuable, and hard to reach through other channels. Mobile game advertising is also considered a high-quality channel to advertise in, with high brand safety, which refers to how safe the advertised brand is from being associated with something negative or inappropriate (Amazon, n.d.), and performance. (IAB, 2024) Games advertising also offers great measurability for advertisements, which is considered an important factor in digital advertising. (Agrawal et al., 2020)

Some of the most important metrics measured in games advertising are related to ad engagement, such as click-through rate, which represents the share of clicks to impressions, and conversion rate, which represents the share of conversions (e.g. purchases, installs) to impressions. In addition, metrics like brand lift, which measures ads' effect on positive brand perception, viewability, which measures how much of the impressions have been displayed and seen, as well as reach, which measures the size of the audience that has seen the advertiser's ads are measured to evaluate games advertising. (IAB, 2024)

Mobile game companies often optimize ad performance within their games. (Truong, 2024) These optimizations can either affect what happens within their ad auctions, and what can be seen on the game side. A dichotomy to game side optimization and pre-bidding optimization can be made, based on where the optimization happens. Game side optimization regarding ads relates to how users are motivated to watch ads within the game, how players are motivated to watch multiple ads, and how ads can be implemented without hurting in-app purchase revenues or retention. Pre-bidding optimization on the other hand, includes everything that happens between the mobile game and the advertising auction. Examples of this are attempts to maximize impression values through sharing as much data about the recipients' behaviour and context as possible, as well as constructing a large demand pool. (Ungureanu & Popescu, 2022)

Game-side optimizations are a part of game design, which is not researched within this thesis. This thesis will focus on pre-bidding and how to optimize it. From a mobile game publisher's standpoint, this can include maximizing the amount of demand sources, including as many useful data points within bid requests as possible, and utilizing first-party data for targeting. (Ungureanu & Popescu, 2022)

2.3.1 Ad fill in mobile games

An important metric related to programmatic advertising is fill rate. Fill rate represents the share of purchased impressions to auction events, indicating the percentage of ads that are purchased. (Nguyen et al., 2017) Alongside CPMs and impression amounts, fill rates contribute to the total advertising revenue for mobile game companies. Since fill rate is one of the major revenue contributors, it's vital for advertising publishers to ensure as high a fill rate as possible. (Ungureanu & Popescu, 2022) This can be done by having several demand sources, such as DSPs, networks, and direct connections with advertisers. (Waytograd.com, 2023)

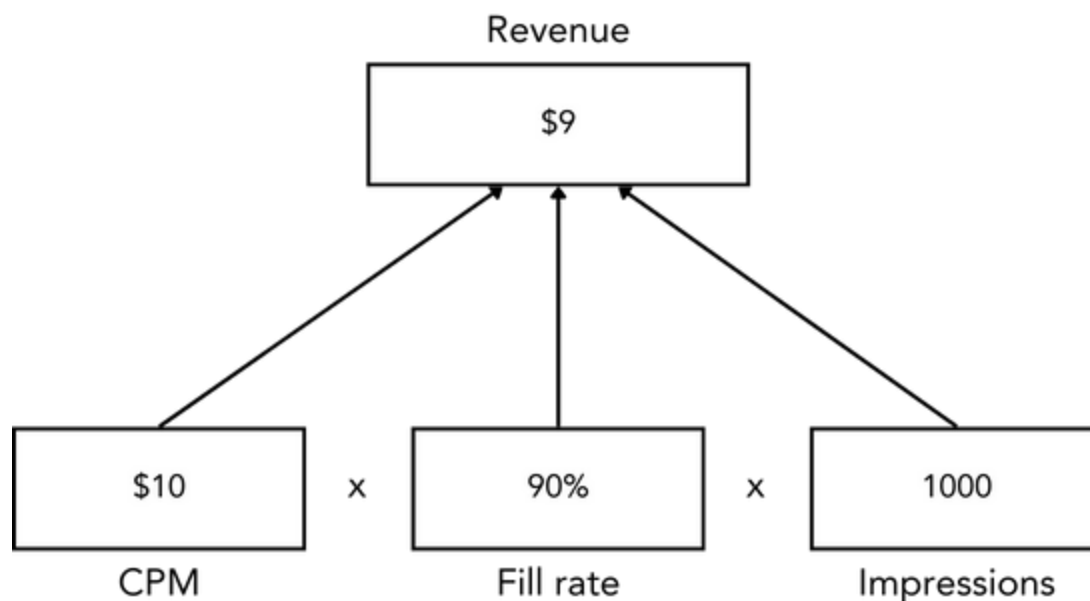


Figure 5 Revenue contribution. Own image

Different advertisers have different goals for their advertising. One dichotomy that's used is the split between performance advertising and brand advertising. (iion, 2023; Fishman, 2023) Brand advertising is often more awareness focused (Noller & Magalon, 2016), whereas performance advertising is more focused on shorter-term financial returns. (iion, 2023; Fishman, 2023) Brand advertising targeting can be described as less individual-oriented, and more target group oriented and according to Noller and Magalon (2016), brands attempt to recognize certain target groups with certain socio demographic characteristics to ensure appropriate audience for their advertisements.

However, brand advertising isn't as prevalent in mobile games advertising as performance advertising. (Lee & Shin, 2016; Fishman, 2023) Performance advertisements in mobile games often attempt to have the player install the advertised application. (AppsFlyer, 2024) App install ads are a form of performance advertising, where the performance metrics are often driven by return on ad spending (ROAS). (Ayala-Gómez et al., 2021) Performance advertising, including app-install ads has long been extremely prevalent in mobile games due to the ability for great ROAS measurability and granular targeting possibilities (iion, 2023; Fishman, 2023) Since app-install ads in mobile games are often focused on performance, mobile game advertising and user acquisition (UA) are intrinsically intertwined subjects. This is known as paid user acquisition, which is a prevalent way of increasing the user base of games and applications. (Ayala-Gómez et al., 2021) The reason why the motivations of the advertising side are important to keep in mind is that often the ads in mobile

games are attempting to lure players out of the game they're playing by installing the new app. Click-through rates and conversion rates are some of the metrics that advertisers attempt to maximize, which may hurt the source game's player base. Click-through rates and conversion rates are, however, only a part of the advertising machinery evaluation. Arguably, the most important metric for assessing UA campaigns is the expected life-time value (LTV) of the players that install the game. (Applovin, 2024) Often UA campaigns aren't shown blindly to random users but attempt to target high yielding users, also known as whales, by using identifiers or sophisticated probabilistic targeting models. (Knezovic, 2024)

Understanding the advertisers' motives for advertising within mobile games is vital for having a holistic overview of this topic, since there is often a trade-off. The more data is given to advertisers, the better signals they have and the more efficient they can make their UA campaigns. This can naturally lead to cannibalization of revenues from the publisher, since efficient advertising may cause game publishers to lose their users. The better performance different UA campaigns have, often the more damaging the results are for the app where these campaigns are shown. Whereas increasing costs per mille (CPM), a metric for the amount of money advertisers are paying for a thousand impressions, may seem like an unambiguous win for publishers, it's good to keep in mind that the better performance of UA campaigns tends to be the reason why advertisers are willing to pay these higher CPMs. This is an important clarification to make, but for simplicity, this research will not be focusing on user base cannibalization caused by UA but will focus on ads inventory value.

2.3.2 Data collection in mobile games

When users access mobile game applications, some information is shared with the application's publisher. Such information includes, but is not limited to the device type, operating system version, language and country. (Brückner et al., 2017) This type of information is often necessary for the publisher in order for the game to work correctly. (Unity, n.d.) Information of this kind is called contextual data, since it refers to the context in which the application is running. (Bleier, 2021)

In addition to contextual data, behavioural data is another type of data collected from users. Behavioural data includes information on what the user does in the application. This data can include practically anything included in the functionality of the application, that is dependent on the user's actions. (Bleier, 2021) Behavioural data is an extremely broad range of data, since it can include every action that players take. Behavioural data can include information on user flow, such as how much money is spent, how much time is spent, how many levels are played, how these

levels are played, and after which event, a player stops playing the game. Mobile game companies', as well as any other applications publishers' motives behind collecting first-party data from players generally relate to optimizing metrics that either directly or indirectly create revenue. (Long, 2022)

Generally, first-party data is already widely used by mobile game companies. (Pocketgamer.biz, 2024) This is due to great collection capabilities combined with a near-infinite amount of data points that can be observed and drawn information from. Data is collected by mobile game companies for several reasons, ranging from creating a better user experience and a more engaging game to monetization optimization through in-app purchases (IAP) and games advertising. (Pocketgamer.biz, 2024) However, it's vital for mobile game companies to understand when it's allowed to use data collected from their players, especially when it's used for sharing insights to third parties. Due to the importance of data compliance, the following chapter will create a comprehensive overview on the data privacy aspects related to mobile game advertising and how mobile game companies can comply.

3 Data privacy

One of the most important things to take into account when considering future-proof ways to do mobile game advertising is data privacy. The data privacy dimensions examined in this thesis include restrictions and limitations from many sources regarding targeted advertising, such as legislation, industry standards, device manufacturers, operating system developers and the ad recipients themselves. This chapter will be examining data privacy through the different legislations and standards and considers how these restrictions affect advertising.

The advertising technology ecosystem is constantly under fire from different sources due to ethical questions related to how the current ad serving systems work. Much of the critique related to the advertising ecosystem is targeted at the way data is shared between third parties and how these data sharing patterns are opaque for the end user. (Myrstad & Tjøstheim, 2021) A major issue regarding the current way online advertising ecosystem operates is that there's little ways to control what happens to user data after it's been passed on to third parties. Since user data can be collected from a myriad of sources, data companies have great capabilities for creating comprehensive user profiles utilizing different data points from multiple different sources. Often these companies also have means of connecting loose data points back to a user profile, after which these connected data points form a comprehensive user profile and can be used for sophisticated targeted advertising. (Myrstad & Tjøstheim, 2021)

A benchmark example of user data being used for purposes, for which the user hasn't consented to, is the Cambridge Analytica scandal of 2018. (Bruns, 2021) The Cambridge Analytica scandal, in brief, was an event where Cambridge Analytica, a political consulting company misused user data harvested from Facebook to affect election results. It's a case example of what data giants can do when they have robust user profiles that cover several data points that users don't know are being shared and used.

Whereas legislation and standards related to data sharing have become stricter, there are actors within the advertising ecosystem hoarding huge amounts of data and creating user profiles based on them. After the Cambridge Analytica scandal, companies in possession of such data have been stricter about sharing it and operate within a 'black box' where it's hard or even impossible to inspect how the system works from the outside. (Bruns, 2021)

The advertising technology ecosystem makes it possible for these data giants to collect great amounts of user data without proof that all the data is being used in ways disclosed to and accepted

by the users themselves. Figure 6 illustrates how data is shared between publishers and advertisers, and how only a fraction of the data sharing is observable by the publisher. Figure 6 uses a webpage as an example, but the data sharing processes are similar in mobile games as well. However, new legislation and privacy frameworks such as TCF and ATT have already made these unethical data collection practices more difficult and so created a more private environment for users that opt out of tracking. A great piece of evidence of this are lower advertising impression prices for players that opt out of ATT and TCF, which signals that they can't be targeted as well as other users. (Kraft et al., 2023)

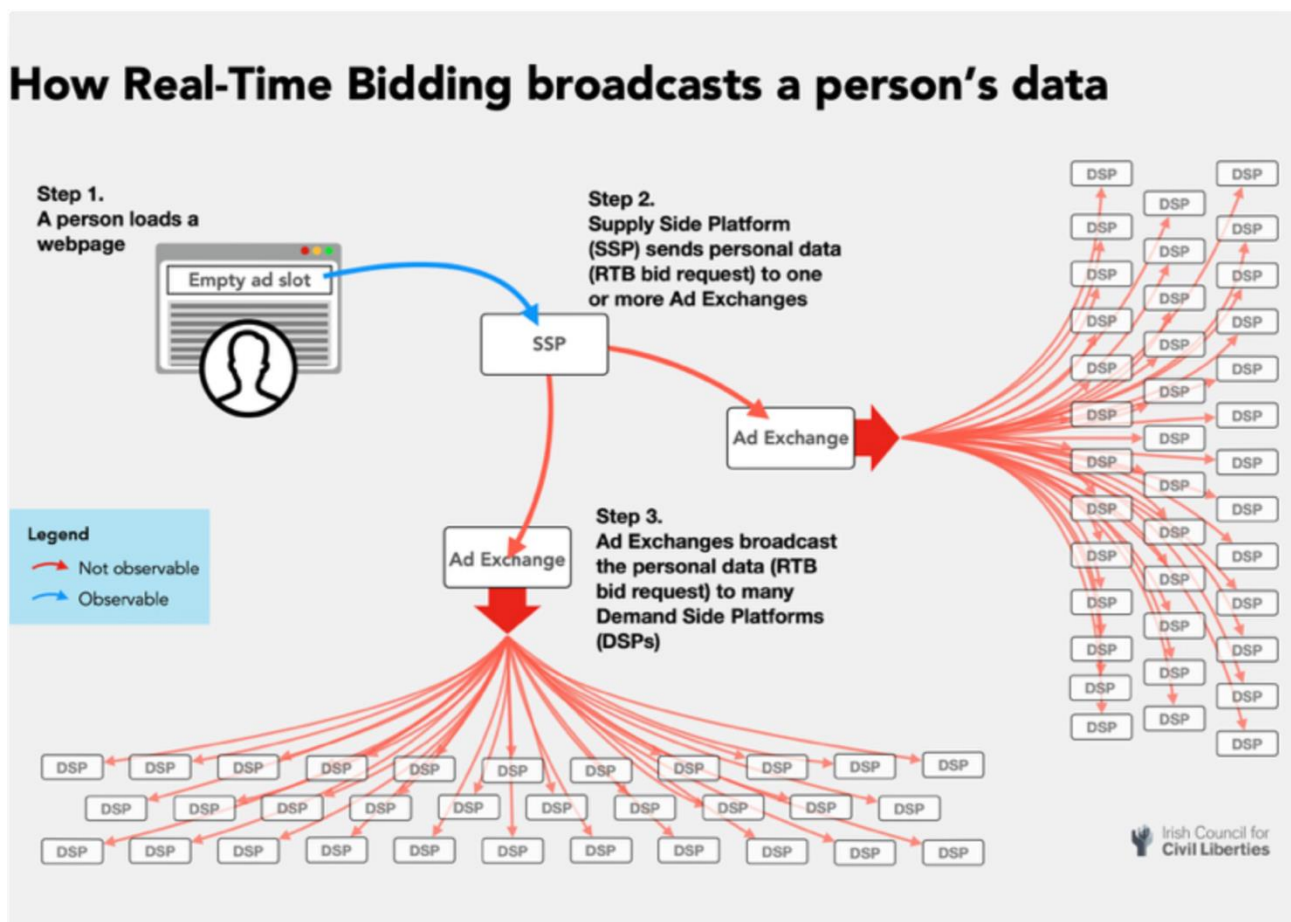


Figure 6 Data sharing in RTB (Irish Council for Civil Liberties, 2022)

3.1 Data privacy legislation

Legislation regarding data privacy is the overarching topic that restricts all operations related to targeted advertising. Device manufacturers, operating systems, applications, websites, advertisers, SSPs, DSPs and mediation platforms all must be compliant with legislation related to targeted advertising in order to operate legally. This sets a multitude of rules and limitations to how targeted advertising can be operated within any part of the advertising ecosystem. Currently there are

multiple different data privacy legislations in different countries and regions that have major differences between them. To mention a few examples of data privacy legislations that must be taken into account when doing targeted advertising in different countries are the General Data Protection Regulation (GDPR) (European Union, 2016) in the European Union, Lei Geral de Proteção de Dados Pessoais (LGPD) (Brasil, 2018) in Brazil, Children’s Online Privacy Protection Rule (COPPA) (U.S. Government Publishing Office, 2013) and California Consumer Privacy Act (CCPA) (California Legislature, 2018) in the USA. These legislations have many key characteristics in common, such as the overall focus on protecting individual’s data, transparency and possibilities for individuals to have access to and control over the data collected of them.

According to the GDPR’s chapter 2, article 6 (2016), all personal data requires explicit consent for it to be processed. This clear affirmative act of giving consent should be freely given, specific, informed and unambiguous. This differs to some extent from the CCPA, which instead of requiring explicit opt-in consent for processing personal data, requires a mandatory option for opting out of sales of personal information. (California Legislature, 2018) Differences in regional privacy legislation is a reason why there is not a single adopted solution for targeted advertising. Some approaches that are legal in the USA, for example, may be illegal within the EU. Since the GDPR is among the stricter data privacy legislations in the world, it will be the only regional privacy legislation this thesis will focus on. This is because if a company operates according to the GDPR, they are able to operate in most countries.

3.2 Transparency & Consent Framework

To handle consent requirements in a legally sound way, it would be tedious and expensive for all companies to research how to comply with complicated legislation, as well as make their own consent collection frameworks and platforms. Interactive Advertising Bureau (IAB), in collaboration with member companies and trade associations, have created a Transparency and Consent Framework (TCF) to meet user, industry and regulatory needs. (IAB Europe, n.d.) TCF in itself isn’t exactly a regulatory, hardware or software related requirement, but many actors within the advertising technology ecosystem require TCF to ensure compliance legislation. TCF can be characterized as a standard and a framework for complying with GDPR. To comply with TCF, there are several different Consent Management Platforms (CMP) which is a platform used for informing users on their data processing and collecting consent regarding it. The CMP also creates a TC String, which is a consent information standard within TCF, that can be sent to other parties within the bidding process to inform the advertisers about the users’ consent.

TCF and its compliance with the GDPR is, however, very nuanced. Ryan and Santos (2022) raise concerns, whether TCF is a sufficient framework for ensuring GDPR compliance due to inability to control personal data flow. Also, one of the major grey areas within TCF and its compliance with GDPR is the existence of “Legitimate Interest”. Vendors can declare legitimate interests to the users’ data and these legitimate interests aren’t subject to consent in the same way as basic vendor data sharing (Veale et al., 2022). These legitimate interests can manually be ticked off, but would require scrolling through long lists of vendors, which is very tedious. Legitimate interests are a nuanced topic, since declaring legitimate interest for a user’s data does grant the vendor their data, and the legal responsibility for using this data for legitimate purposes shifts to the vendor. This feature exists to mainly serve the purpose of essential services that may need the information to ensure functionality. Given this background regarding TCF, it’s justified to say that TCF is mainly a legal framework to ensure legal compliance, and secondarily includes technological aspects related to data flow.

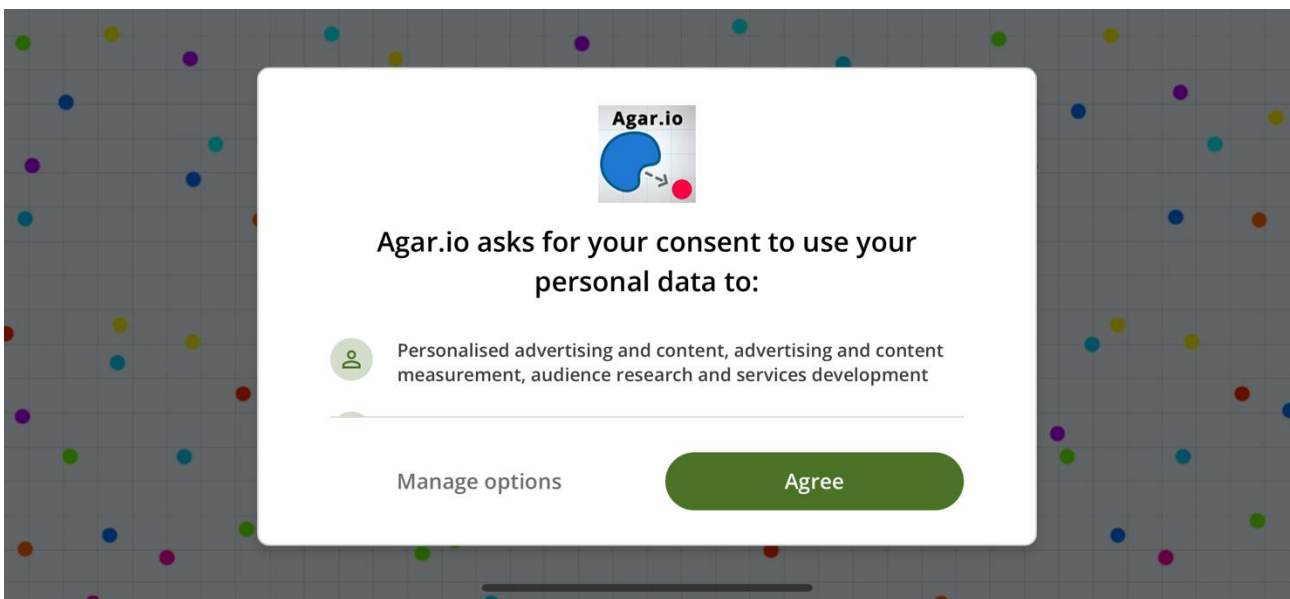


Figure 7 Google's CMP's prompt for TCF consent. Own image.

3.3 ATT and Google Privacy Sandbox

There are limitations to the use of personal data from the side of devices and operating systems as well. The most prominent of which is currently ATT from Apple’s side which is used on Apple’s mobile devices on the iOS operating systems, starting from iOS 14.5. (Apple, n.d.) The main effect of the ATT regarding advertising is that applications don’t receive the IDFA for the users that don’t consent to ATT through the ATT prompt (Figure 7). Devices under the ATT framework have a very

low tracking rate of 17%, (compared to 74% without ATT) which means the vast majority of iOS user traffic became untraceable after the ATT was published. (Kraft et al., 2023)

ATT is a larger whole that has implications beyond the use of IDFA. If a user opts out in the ATT prompt by pressing “Ask App Not to Track”, the user denies consent for all tracking for the application. This also has applications for user acquisition, which is one of the largest advertiser motivations in mobile games. (Lee & Shin, 2016) A key element of ATT regarding user acquisition, is a postback attribution method for advertising. If a player installs an advertised app, but has opted out of tracking through ATT, advertisers have limited information on the information of this player. (Apple, n.d.) Decreased signals related to advertising performance, in addition to not receiving the IDFA, is another key effect of ATT, which decreases ROAS on Apple devices due to worse performance attribution. In a Forbes article, Koetsier (2022) reports the decrease in ROAS to be 38%.

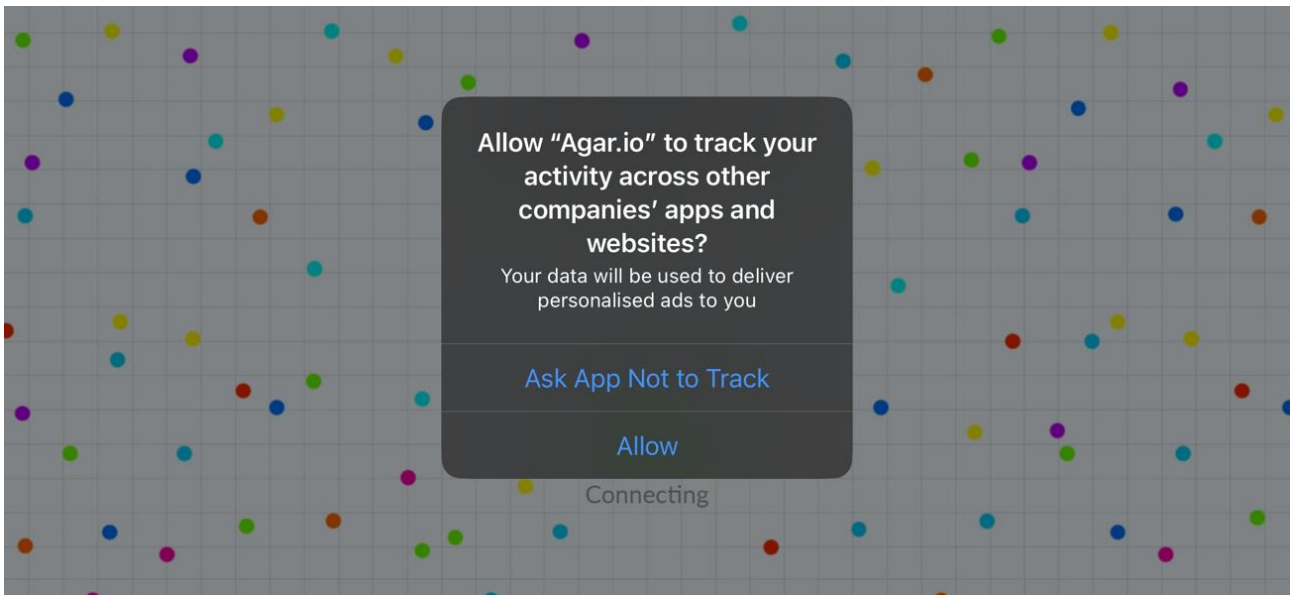


Figure 8 Apple's ATT prompt in Agar.io. Own image.

As mentioned previously, Google is also planning on implementing a privacy-first framework for mobile advertising on Android. Currently this framework is known as the Android Privacy Sandbox. (Google, 2024) Google has already implemented a privacy sandbox solution for the Google Chrome browser, which replaces cookie reliance with an API. However, a privacy sandbox for Android mobile devices is set to be published on a later date. (IAB Tech Lab, 2024) Whereas the details of the mobile privacy framework are largely unknown, it's expected to restrict the use of users' personal data for applications in similar ways as ATT. (Latvala et al., 2022) This would be in

line with what Google has already announced in 2022, which is that it will be moving away from GAID, which is the main identifier used on Android devices for advertising. (Seufert, 2022)

3.4 Compliance with declined tracking

Since tracking and declining to be tracked are central topics regarding this research, it's important to define tracking and to understand what it includes in order to assess potential solutions to the research question. Table 1 comprises different definitions for tracking from different sources.

Table 1 Definitions of tracking.

Source	Definition
Apple, n.d.	“Tracking refers to the act of linking user or device data collected from your app with user or device data collected from other companies’ apps, websites, or offline properties for targeted advertising or advertising measurement purposes. Tracking also refers to sharing user or device data with data brokers.”
Koch et al., 2022	“Tracking is defined as linking collected data with third-party data for targeted advertising or for measuring advertising outcomes.”
Angus et al., 2024	“Tracking is defined as a user-centric data collection method that gathers data in real-time as it is delivered/consumed by enlisted users.”
Lo, 2009	“tracking consumers’ online activities over time ... in order to deliver advertising that is targeted to the individual consumer’s interests. This definition is not intended to include ‘first party’ advertising, where no data is shared with third parties, or contextual advertising, where an ad is based on a single visit to a web page or single search query.”
Tene & Polenetsky, 2012	“tracking users’ online activities in order to deliver tailored ads to that user.”

Apple (n.d.) has also shared concrete examples of what constitutes as tracking. (See table 2)

Table 2 Apple's examples of tracking and not tracking (Apple, n.d.)

<p>Constitutes as tracking</p>	<ul style="list-style-type: none"> - “Displaying targeted advertisements in your app based on user data collected from apps and websites owned by other companies.” - “Sharing device location data or email lists with a data broker.” - “Sharing a list of emails, advertising IDs, or other IDs with a third-party advertising network that uses that information to retarget those users in other developers’ apps or to find similar users.” - “Placing a third-party SDK in your app that combines user data from your app with user data from other developers’ apps to target advertising or measure advertising efficiency, even if you don’t use the SDK for these purposes. For example, using an analytics SDK that repurposes the data it collects from your app to enable targeted advertising in other developers’ apps.”
<p>Doesn’t constitute as tracking</p>	<ul style="list-style-type: none"> - “When user or device data from your app is linked to third-party data solely on the user’s device and is not sent off the device in a way that can identify the user or device.”

In this thesis, a player is considered to opt out of tracking if they decline tracking either through the ATT prompt or device settings, or within the EU, by not giving consent to their personal data being shared through the TCF framework. Also, since the permission for tracking on Apple devices requires explicit consent, if a player's consent is unknown or not available, that player must be treated in the same way as if they had declined tracking. (Apple, 2021) The approach regarding consent is similar with TCF, since explicit consent is required for tracking. Therefore, players with unknown consent status must not be handled in the same way as consented players. The GDPR doesn't recognize or define the term 'tracking', but since personal data sharing which includes identifiers is subject to explicit consent from the user according to article 4 of the GDPR (2016), we can deduce that tracking falls under the broader topic of personal data sharing.

Apple's ATT consent isn't considered a sufficient consent signal for sharing user data in terms of the GDPR. (Didomi, n.d.) Due to this, a player can also opt out of tracking through the TCF prompt, which is a framework used in the EU to collect consent data points required by the GDPR. Also, other regional privacy legislations, such as California Consumer Privacy Act (CCPA) allow users to opt out of targeting. However, these legislations don't require explicit consent but instead allow opting out of targeted ads through tracking. This research will also touch upon regional privacy legislation and will use GDPR as a benchmark, as mentioned in chapter 3.1 due to its strictness.

To summarize, this research considers players to be able to opt out of tracking by choosing to decline data sharing through a Consent Management Platform (CMP), which records consent according to the Transparency & Consent Framework (TCF), or declining tracking through Apple's App Tracking Transparency (ATT) framework's prompts or settings. Also, users with missing consent information regarding either TCF or ATT are treated in a way as if they had declined consent. (Apple, n.d., GDPR, 2016)

3.5 Privacy compliant solutions

Digital advertising is commonly done with targeting, whether it's contextually targeted or behaviourally targeted. (Bleier, 2021) Since there is pressure for advertisers to find new ways of targeting that will be possible and legal in the future, the advertising technology industry is actively looking for ways which would meet legal and technological expectations. Most conversation on the future of targeted advertising revolves around the deprecation of third-party cookies, which is becoming more common within browsers and operating systems, and Google's solution for cookie deprecation and increased privacy is also expected to take place soon. (Latvala et al., 2022) However, even targeting that doesn't require third-party cookies is expected to go through further

tightening privacy changes, which also forces parties that don't use cookies for targeting to consider their future targeting possibilities. (Long, 2021) Privacy changes unrelated to cookies affect mobile more due to in-app advertising not utilizing cookies most of the time.

Whereas many advertising solutions describe themselves as future-proof, many of these methods do not help mobile game companies that are attempting to monetize players who opt out of tracking, since these solutions are often focused on cookie deprecation on the web, or for other reasons non-viable for mobile game use. In this chapter, different existing and early-stage solutions for future-proofing ad inventory as well as solutions for maximizing inventory value for mobile game players who opt out of tracking will be examined.

To understand which solutions can be utilized for players who opt out of tracking, restrictions regarding the topic must be understood. In chapter 3.4 we've assessed what is included as tracking and which events take place after a player opts out of tracking through different methods.

Considering the previous definitions and restrictions set by legislation and other standards, some generalizations can be made. Targeted advertising isn't inherently banned for players who opt out of tracking, as long as targeted advertising isn't done through linking identifiable data points collected from players with data from other companies. If targeting can be done fully using the data the mobile game company has collected themselves from the player, also known as first-party data, and without sharing personal user data with the demand side, targeted advertising is allowed.

(Jerath, 2022)

It should be recognized that ATT and TCF pose different restrictions related to data sharing for advertising purposes. TCF can be described as stricter than ATT, since a declined TCF prompt restricts all personal data sharing for third parties for advertising purposes (unless legitimate interest is declared). Whereas ATT restricts tracking and specific instances of data sharing for targeted advertising, TCF restricts overall personal data sharing. Due to the differences between these requirements, all potential solutions must be considered from an ATT and TCF viewpoint separately, and due to this, many solutions that might be compliant with ATT aren't compliant with GDPR. However, even if a proposed solution would not comply with both, but does comply with either one, it can still be considered viable and useful for publishers.

Now, understanding the restrictions for publishers and advertisers regarding tracking, we can consider different solutions presented for future-proofing advertising. It's important to note, however, that declining TCF, which constitutes as not consenting to personal data processing, sharing for advertising targeting, restricts any segmentation and profiling as well, if the segments

and profiles are made using personal data. Declined ATT, however, is more lenient towards advertising targeting, under which segmentation and aggregation are viable methods for targeting.

3.5.1 First-party data

As examined in chapter 2.3.2, first-party data is a term for data collected from direct interaction with customers. Latvala and others (2022) recommend companies to create a comprehensive first-party data strategy, since third-party data is expected to become harder to utilize. This first-party data could then be used to create better targeting for these users and fetch higher prices, given that this targeting complies with privacy requirements.

A classic example of first-party data being utilized for advertising, where all personal data is contained within the publisher's side is New York Times' shift to only using first-party data for advertising. Fischer (2020) reports that New York Times is packaging their users to 45 different first-party audience segments with 6 different categories. This way, advertisers are able to show advertisements to users within a certain audience segment, without having personally identifiable information (PII) or tracking in place.

3.5.2 Data processing

Krantz and Jonker (2025) define data processing as “the conversion of raw data into usable information through structured steps such as data collection, preparation, analysis and storage”. In the context of advertising solutions for mobile game companies, it could be used in different ways to not have to share raw, personal data points about users.

Ullah and others (2023) consider data anonymization, which is a form of data processing, to be a solution to meet privacy requirements in mobile advertising. This process includes taking any data that includes PII, and masking or removing these data points from the bid requests shared with the demand side. This would be applicable under ATT, but not necessarily under the GDPR due to mobile game companies to require consent for personal data collection and data processing as well.

Another form of data processing that may hold value for mobile game companies' advertising inventory values is data aggregation. (Pocketgamer.biz, 2024) IBM (n.d.) defines data aggregation as a “process where raw data is gathered and expressed in a summary form for statistical analysis.”. User data being combined and used on a game or application level is a form of data aggregation. Advertising targeting solutions utilizing data aggregation seem to be viable from the perspective of most privacy restrictions, since individual user data isn't shared, and therefore the players aren't

being tracked. The proposed increase in value for advertisers results from having better insights on the game's audience as a whole, instead of having no data points available from individual users that decline tracking. Similarly to data anonymization, however, data aggregation may not be plausible under the GDPR due to mobile game companies needing to collect and process this data, which requires consent, if these data points can be described as personal.

An example of a data aggregation-based solution is an advertising network Nefta, that suggests an approach to monetize users that opt out of ATT better. "Using first-party data both internally - as it is widely employed now - and externally to contextualise player value... is likely the best way to future-proof any gaming business." (PocketGamer.biz, 2024) Nefta operates in a new way compared to the traditional ad network. Nefta's website (Nefta, 2024) suggests a solution to lost iOS in-app advertising revenue described by the following: "By analysing patterns of behaviour as players interact with apps Nefta discovered that certain patterns respond better to certain ad creatives. As a result, Nefta is able to charge marketers a higher rate and pay publishers a premium.". This approach would use publisher first-party data for creating models and behavioural patterns of mobile game audiences and use this information to fetch higher prices due to better ability to place advertisements into games where the audience would match the promoted product. This would be allowed despite declining ATT, because the user data is aggregated and normalized and treated on an application basis, instead of individually. However, since TCF and GDPR restricts personal data sharing to third parties, such solutions aren't plausible under the GDPR if data included in these aggregations, is personal data.

3.5.3 Segmentation and taxonomies

Other suggested approaches include cohort segmentation and taxonomies. As an example, IAB Tech Lab's Project Rearc has created an addressability specification called Seller Defined Audiences (SDA). (IAB Tech Lab, n.d.) IAB Tech Lab describes the key benefits of SDA to be that it doesn't rely on cookies or mobile IDs, and it protects against publisher data leaks.

In essence SDA, as well as other segmentation and taxonomy methods, would work in a way where publishers utilize the data available on their users to create targeting profiles categorized by a predefined set of categories. Advertisers or DSPs would then be able to bid for an audience segment instead of an individual identifier. (IAB Tech Lab, n.d.) A taxonomy-based approach should at least be usable despite users declining ATT, as long as it can be ensured that networks don't connect these data points with information collected from other apps or websites. Compliance with privacy

legislation, e.g. GDPR, depends on whether these segments are done using personal information, and whether the information shared can be traced back to individual people. (Skiera et al., 2022)

Similarly to the previous example of New York Times' audience segment advertising method in chapter 3.5.1, if a segmentation solution would be done on a mobile game publisher side, it could produce value for both advertisers and the publisher. (Fischer, 2020) Since segment information is considered more acceptable to share than personal information, the main question when doing audience targeting would shift from "How can information that's valuable for advertisers be shared with advertisers?" to "How can publishers collect information from players that's valuable for advertisers?". This is due to mobile games having very different contextual data for targeting advertising to players, compared to a newspaper where segmentation based on context can quite easily be made. This is an example of why mobile games may require different solutions than other platforms due to different environment and available data.

3.5.4 Contextual data

As mentioned in chapter 2.3.2, contextual data is considered to be more privacy friendly than behavioral data, and it's considered more acceptable to use for targeting purposes than behavioral data. (Bleier, 2021) Also, when targeting is done purely contextually, there's no personal data exchanging hands, which means pure contextual targeting is compliant with both TCF and ATT (Dewitte, 2023)

Contextual targeting isn't exactly a future solution, since it's already being done in mobile games. Many actors in the mobile advertising ecosystem are now considering contextual data as a targeting method, now that identifiers are becoming scarcer. (Adjust, 2022) If mobile games' bid requests could be enriched with more contextual data than they currently are by giving advertisers additional targeting parameters they should be able to reach better targeting. As Chen and others (2017) suggest, implementing additional contextual metrics to RTB auctions to increase engagement between users and the advertisers, which on the long run will increase publisher revenues. However, when considering enriching contextual data, it must be taken into consideration, that there is a large grey area between contextual and behavioral data, since there are no exact definitions for them. (Bleier, 2021)

When considering contextual data as a targeting method specifically for mobile games, it's important to note the shortcomings of mobile games when it comes to context. When compared to a social media platform or a news application, mobile games have significantly less different

contexts. Social media platforms and news applications may want to use the content the users engage with as context, like New York Times does. (Fischer, 2020) Mobile games, however, lack a broad range of content that could be used to understand the users' interests, and what should be advertised to them. Therefore, when considering contextual data as a future targeting method for mobile games, it may not be as successful as in other applications.

Now we have completed a theoretical background for mobile game advertising and data privacy. The background also assesses different solutions that could raise advertising inventory values for mobile game companies. With the theoretical background, we now have an accurate view on how previous literature connects to the research question. Based on this theoretical background, the next chapter will examine the methodology used for conducting this research. The proposedly privacy compliant solutions presented in this chapter will also be connected to empiric data, and based on their synthesis, conclusions are made regarding what's plausible for mobile game advertising under the examined privacy requirements.

4 Methodology

The dual purpose of this research is to produce information mobile game companies can use to combat declining revenues per impression while expanding the knowledge base of information system science literature. The environment for this research is a relatively new business-related problem that has very scarce scientific literature around it. Any chosen research paradigm or methodology needs to be suitable for producing a pragmatic result that can be used by actors within the mobile game industry, despite there being few existing solutions for observation and inspection, as well as very scarce scientific literature available surrounding the topic. Due to a lack of existing solutions and literature, as well as the recency of the research problem, this research aims to understand the relationships between different parts of the advertising ecosystem. Since this thesis doesn't aim to confirm predetermined relationships, but to understand and define these relationships, this research can be described as explorative. (Boudreau et al., 2001) Given the exploratory nature of this research and the lack of observable existing solutions, a qualitative approach will be used, and a methodology is chosen to fit these prerequisites.

4.1 Design science research methodology

Due to the previously mentioned criteria for the methodology, this research uses design science research methodology as its methodology. Design science research methodology is a methodology used within design science research, which is a broader research paradigm. Design science research is rooted in solving problems through producing artefacts through research. (Hevner et al., 2004) These artefacts include “any designed object with an embedded solution to an understood research problem.” (Peppers et al., 2007) Examples of these in design science research literature are constructs, models, methods and instantiations. (Hevner et al., 2004) Design science research is an iterative process, where feedback will be given regarding an artefact, which will be altered. The artifact is also subjected to testing and validation through different approaches, such as technical testing or feedback from industry professionals (Peppers et al., 2007).

Hevner and others (2004) describe problems that should be solved through design-science research as “wicked problems”. What separates these wicked problems from routine problems from a design perspective is how they can be solved. Hevner and others (2004) characterize routine design as applying existing knowledge to organizational problems. Design-science research differs from these so-called routine problems by using unique and creative approaches for solving important unsolved problems. Examples of these wicked problems are described by Hevner and others (2004) by

several characteristics. Mobile game companies' problem of declining revenues from untraceable players can be described as a wicked problem, since it aligns with multiple of these characteristics presented, as elaborated in the table below.

Table 3 Wicked problem characteristics according to Hevner and others (2004), and their alignment with the research

Wicked problem characteristic	Alignment with research problem
Unstable requirements and constraints based upon ill-defined environmental contexts	Strong alignment. The advertising technology industry is constantly going through changes related to privacy legislation and requirements, making the environmental context ill-defined and unstable.
Complex interactions among subcomponents of the problem and its solution	Strong alignment. The advertising ecosystem is multi-faceted with several different actors with siloed information and strategies that affect the larger whole, creating complex interactions among related components.
Inherent flexibility to change design processes as well as design artifacts (i.e., malleable processes and artifacts)	Strong alignment. Since the advertising ecosystem is rapidly changing and mobile game companies often must accommodate to these changes, flexibility for processes and artefacts is needed.
A critical dependence upon human cognitive abilities (e.g., creativity) to produce effective solutions	Some alignment. Whereas human cognitive abilities may be useful for producing effective solutions, dependence on legal, technological and cross-organizational collaboration abilities is in the center of producing this issue.
A critical dependence upon human social abilities (e.g., teamwork) to produce effective solutions	Some alignment. Whereas human social abilities may be useful for producing effective solutions, dependence on legal, technological and cross-organizational collaboration abilities is in the center of producing this issue.

Another fundamental characteristic of design-science research is the combination of relevance and rigor (Hevner et al., 2004). Relevance is centered around research being done to solve real-world problems and aiming to produce artefacts that provide solutions to these problems. In design-science research relevance ties the environment and IS research together, and the connection is described as business needs. By conducting IS research with the aim of producing useful artefacts,

the finished IS research should have applications to the environment from which the research problem was received.

Rigor, on the other hand, encompasses the strict requirements for the research set by the knowledge base, which includes e.g. theories, frameworks and data-analysis methods. By accompanying relevance with rigor, it can be ensured that the finished IS research produces additions to the knowledge base in addition to producing a usable artefact. In this research the artefact created through the design-science research process will contribute to the existing knowledge base by producing new information on a topic with scarce scientific research. (Hevner et al., 2004)

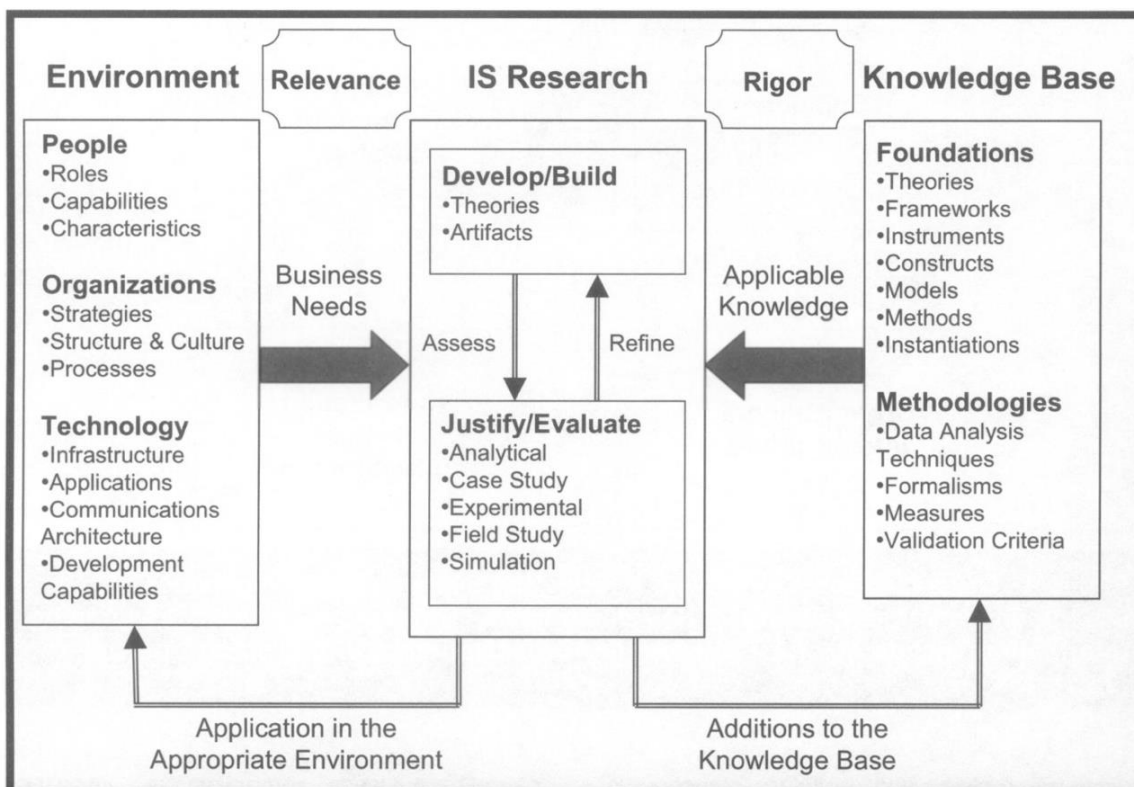


Figure 9 Information systems research framework in design science research (Hevner et al., 2004)

In the figure below are guidelines for design science research by Hevner and others (2004), that will guide this research. The aim of this research is to design an artefact in the form of a method, and more specifically a framework (Guideline 1). This framework aims to find a technology-based solution to the problem mobile game companies are experiencing regarding declining advertising revenues for untraceable users (Guideline 2). The evaluation of this design will be done by industry professionals, that are equipped with knowledge to give feedback on the proposed artefact (Guideline 3). The finished research and artefact aim to provide contributions to the scarce scientific literature surrounding the topic (Guideline 4). Rigorous methods will be used when analysing empiric data collected, as well as iterating the model according to feedback (Guideline 5).

The design process for the framework, as well as iterations on the framework utilize information collected from industry professionals of different knowledge bases to ensure reaching an end result that works in the problem environment. (Guideline 6). Finally, the research will be presented to both technology-oriented and management-oriented audiences to ensure usable results (Guideline 7).

Table 4 Design-science research guidelines (Hevner et al., 2004)

Guideline	Descriptions
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

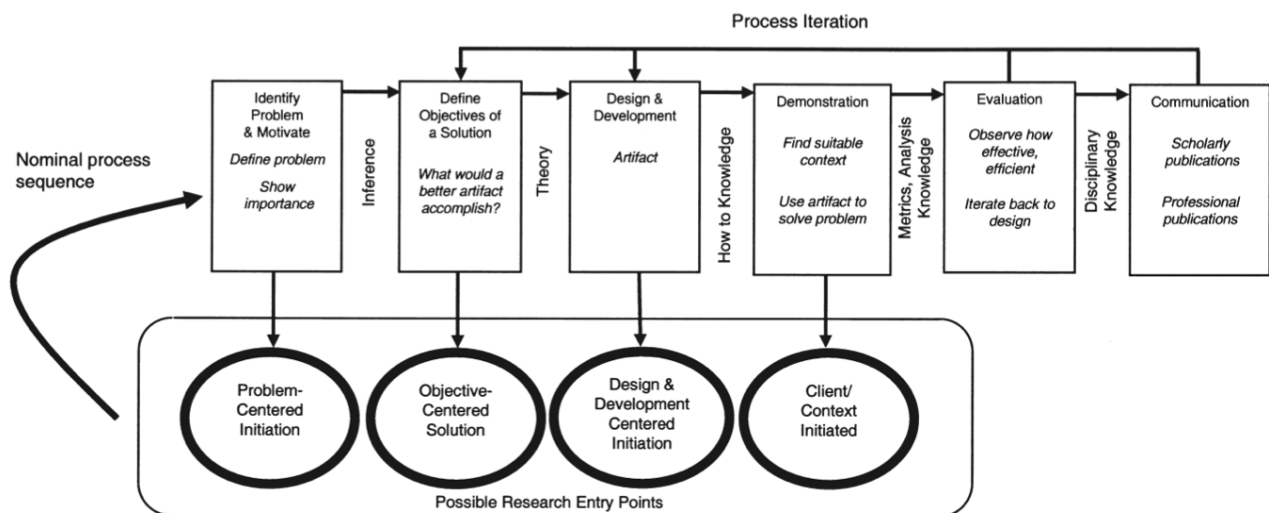


Figure 10 Design-science research methodology process model (Peppers et al., 2007)

In addition to following the guidelines of design-science research presented by Hevner and others (2004), this research will follow the design-science research methodology process model created by Peppers and others (2007). The process model describes the starting point and the process advancement when using design-science research methodology. The entry point for this research according to the process chart is Problem-Centered Initiation. The research will follow the process iteration, but however due to the inability to validate the produced framework via rigorous testing, the number of iterations will be limited. Also, validation through the concrete application of the artefact remains to be done outside the scope of the research itself, since implementation of the produced framework would require a mobile game company to invest significant resources in order to have their operations working according to the framework.

4.2 Research conduction

In this chapter a more thorough plan is constructed for conducting the research. Since the research around the exact topic is very scarce, an explorative and ideational approach is used for this research. To explore possible solutions to the research problem, advertising technology and advertising monetization expert interviews were conducted with industry professionals. These interviews were conducted as semi-structured interviews to ensure that different thoughts and views could be further explored during the interviews in addition to the questions prepared (Hirsjärvi & Hurme, 2022). All interviewees were informed of how their answers would be used, how their information would be presented in the publication and how the recording of the interviews would be used and stored. Also, prior to the interviews, all interviewees received a privacy notice made according to the University of Turku's guides and template. They were also asked within the

interview, whether they consent to the disclosed use of their information. These interviewees were selected, since they all have a holistic understanding of the mobile game advertising ecosystem, including information on mobile game advertising, privacy legislation and requirements, auction and pricing mechanics, as well as existing operating models.

Hirsjärvi and Hurme (2022) also list more benefits of interviews, of which the most important ones to mention regarding this research, are the opportunity for subjects to give broad answers and explain robust information, the ability to tie answers to a larger context, and the ability to clarify and elaborate answers during the research. These mentioned benefits are extremely important due to the topic of this research. The answers may be very robust and require plenty of clarification and elaboration, as well as part of a much larger context that may require much explanation. Most of the negative sides of interviews that Hirsjärvi and Hurme (2022) list aren't crucial for this research. However, the risk of misinterpretations has to be recognized when considering the results.

Since this thesis has already identified the research problem, as well as described objectives for an artefact as a solution, we can move on to the third part of the Design-science research methodology process model by Peffers and others (2007). The third part of the process is designing and developing a preliminary artefact. This preliminary artefact will be designed based on the existing knowledge base as well as an initial round of expert interviews.

4.3 Expert interviews

The purpose of this chapter is to examine seven expert interviews that have been done. With the existing research literature, and the analysed information from interviews, the preliminary artefact will be developed. Below is the table of experts interviewed. All the interviewed experts have a long ongoing career within mobile game advertising and represent organizations in the field or work independently with proven experience. All experts' job titles have been generalized to further anonymize the participants, and industry or field column has been added to highlight which actor in the ecosystem they represent.

Interviewee	Description	Industry or field	Duration of interview
I1	Manager, mobile game ad monetization	Mobile game publisher	55 minutes
I2	Consultant, mobile game ad monetization	Independent, mobile game advertising ecosystem related	40 minutes

I3	Founder	Ad network	50 minutes
I4	Senior Manager, mobile game ad monetization	Mobile game publisher	45 minutes
I5	Analyst, mobile game ad monetization	Independent, mobile game advertising ecosystem related	30 minutes
I6	Manager, mobile game ad monetization	Mobile game publisher	35 minutes
I7	Manager, mobile game ad monetization	Mobile game publisher	35 minutes

The interviews were held as semi-structured interviews, which allows exploration of topics outside a strict list of questions. (Hirsjärvi & Hurme, 2022) The interviews were centered around the following topics:

1. Different privacy frameworks
 1. ATT
 2. TCF
 3. Android Privacy Sandbox
2. Collection and use of publisher first-party data
 1. Difference between contextual and behavioral information and their use
 2. Value of publisher first-party data for advertisers
3. Potential current or future solutions for mitigating CPM decline
 1. Taxonomies
 2. Data aggregation and anonymization
 3. Different demand sources

From the empiric material gathered from the interviews, it's possible to make professional-backed claims on the plausibility and effectiveness of different solutions, as well as understand different actors in the advertising ecosystem better. The reason why no more than 7 interviews were held is that no new significant topics were brought up in the last interviews, which according to Hirsjärvi and Hurme (2022) signifies saturation having been reached. In qualitative research, the number of interviews isn't the defining factor, since large amounts of rich data can be gathered even from few interviews. This in turn produces a detailed overview of the researched phenomenon, which can be examined. When saturation is reached, it can be assumed that the amount of existing data includes the key results (Hirsjärvi & Hurme, 2022).

4.4 Data analysis

After the completion of expert interviews, the data was analysed to understand which topics were the most significant regarding this research and its problems. The data analysis was conducted as a thematic analysis, which is a method used in qualitative research for recognizing patterns within the data, creating themes based on these patterns, and analysing and interpreting them (Clarke & Braun, 2017) The pattern recognition process begins with coding. Codes are the lowest form of analysis that are picked from the data. These codes are then compiled and compared with each other to form themes from the data. Themes consist of codes about matching categories and are used to create larger patterns. (Clarke & Braun, 2017) After extracting themes from the data, these themes can be used to understand which topics are important from the research viewpoint.

In the case of this research, the interviews were first transcribed in their original language with the University of Turku transcription tool (transcribe.utu.fi). After this, the transcripts were scanned for transcription errors and fixed according to the original interview recording. After having correctly transcribed interviews, the ones held and transcribed in other languages than English were translated to English. Again, the translated translations were scanned for errors, and after verifying their quality, they were ready to be used for further data analysis.

These transcripts were then read, and parts that touched on certain topics were pieced into codes. For coding, simple colour coding was done in Microsoft Word to clarify which topics were under the same category. After the whole data set was colour coded, similar topics were compiled from the set of codes. Certain patterns arose from analysing the codes, and certain clear themes could be found from different interviews. In the chapters below, the recognized themes are interpreted and used to create an improved artefact together with the pre-interview artefact.

The aim of the interviews was to find solutions for mobile game companies' advertising revenue decreases, so the initial coding began with separating different topics based on the solution category. The initial dichotomy was whether the interviewees considered the discussed solutions to be plausible for mobile game companies. This resulted in having codes related to plausible solutions, which could further be categorized based on what the solutions required. These categories were further grouped to form themes, which are examined in the following chapter.

5 Results

5.1 Pre-interview artefact

Before creating a preliminary literature-based artefact, we'll summarize the requirements and limitations set by the advertising ecosystem. The two main limitations from a privacy standpoint are ATT and TCF. As we assessed in chapter 3.4, declined TCF consent is considered stricter than declined ATT regarding advertising targeting. This research aims to produce a framework with solutions that are compliant with either or both limitations, so the basis will be the more lenient limitation, which is ATT in this instance. The created artefact will be created fully compliant with ATT and will highlight solutions that are not compliant with TCF.

Based on the existing information about the topic, some concepts of a framework can be made regarding the maximization of impression values for players that opt out of tracking. The themes that connect multiple research papers suggest that solutions for mitigating the effects of increased privacy requirements include the use of first-party publisher data, use of richer contextual data, as well as segmentation for users. Use of richer contextual data and segmentation require collecting first-party data, which can then be processed to reach the two approaches. These solutions examined through the lens of the restrictions are shown in figure 11.

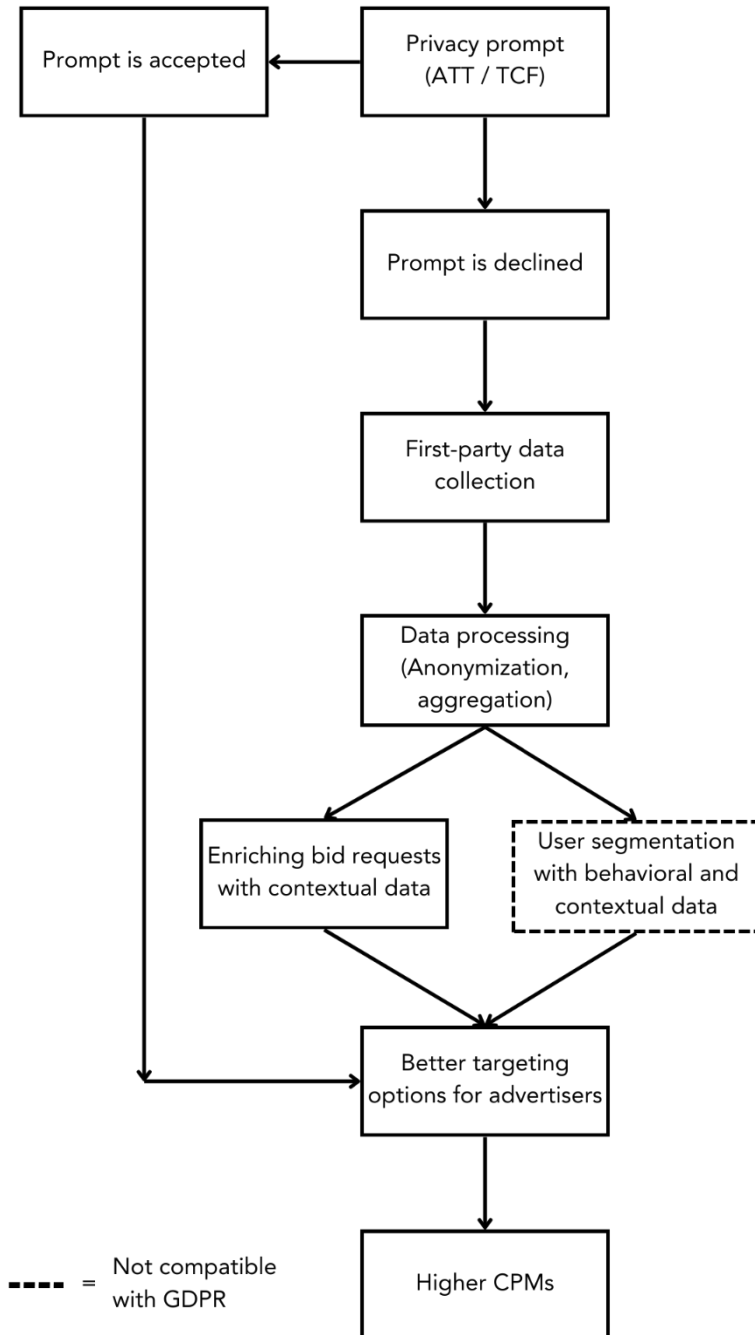


Figure 11 Pre-interview artefact

The walkthrough of this artefact is as follows. First the user is prompted with the privacy prompt, which they can accept or decline. Choosing to accept this prompt allows the publisher to use their full data and share it with third parties for advertising purposes. This grants better targeting options for advertisers, and thus higher CPMs for publishers.

However, if the user declines the prompt, they opt out of tracking according to the details presented in chapter 3.4. In these cases, the publisher can collect data from the user and process it to either

anonymize or aggregate it, so that it can't be traced to any identifiers. Afterwards, contextual data can be added to bid requests to enrich the amount of contextual information advertisers have on the user. Alternatively, publishers can do user segmentation with behavioural or contextual data, and package them into a user segment taxonomy. With these increased amounts of information, advertisers should be able to advertise to segments that are a better fit for them. This in turn should result in higher willingness to pay for impressions, also known as CPM. According to the existing literature regarding the subject, this flowchart should be possible.

The next iteration after this preliminary artefact includes information from the expert interviews and combines their input with the preliminary artefact, which consists of information derived from existing literature.

5.2 Interview results

5.2.1 First party data

Across all interviews, the experts recognized the importance of first-party data for publishers. This is in line with what we've examined in the theoretical background, where first-party data is considered an asset for publishers, especially for the future. (Latvala et al., 2022; Long, 2022; Pocketgamer.biz, 2024) All experts also shared concerns on how first-party data could be utilized for advertising purposes, while complying with privacy. Most experts considered the topic to be a legal question for publishers due to the topic being in a grey area and subject to different privacy legislation and privacy requirement interpretation. However, most interviewees considered there to be value in utilizing first-party data, when that data is handled and shared in a compliant way. The potential use cases were different among some interviewees. 5 and 3 brought up the value of first-party data for advertising in general, and interviewees 2, 6, and 7 also considered much of the advertising-related value of publisher first-party data to come from use cases related to brand advertising. Also, all other solutions that the experts suggested for the research problem were somehow tied to the utilization of first-party data, as examined in the following chapters.

Interviewee 5:

“And so, if you have genuinely first party data, then you could sell that in the sense of... or selling is the wrong way to depict it. But you could monetize that by activating it for ads targeting in your product.”

Interviewee 3:

“[first-party data] is the best, the most future-proof bet” and “first-party data is definitely, I think, one of the main solutions for the problem [lower CPMs].”

Interviewee 6:

“[first-party data] would absolutely be useful...” and “...if we’re selling to agencies, or directly to a brand, we know contextually that x per cent of our users are, let’s say women, or a certain amount of people are a certain age... I do think it would be useful, if we are able to share it.”

Interviewee 7:

“First-party data has value, definitely. Especially for brand advertisers.” and “So for, in order to be able to secure those budgets in the future, it makes sense to utilize your first party data.”

Interviewee 2:

“...so the first party data that's being shared right now. Basically what's most important for branding advertisers which adds revenue is knowing what the demographic makeup of your app is or your game right, so gender split and age, right.”

5.2.2 Brand advertising

Brand advertising, as examined in chapter 2.3.1, as well as mentioned in the previous chapter related to first-party data, is a term many of the experts used to describe a type of advertising that doesn’t necessarily rely on high performance metrics, such as clicks and conversion, but can be used to depict advertising where the goal is to increase awareness and improve perception of a brand. (Noller & Magalon, 2016; iion, 2023) The experts considered brand advertising to not require as granular information on the advertisement’s recipient, such as advertising identifiers or past spending data, but still benefit from being able to target certain demographic groups. Also, Noller and Magalon (2016) consider demographic data, such as age and gender data relevant for data driven media buying. Whereas increased brand advertising didn’t often come up as a solution within existing literature, most interviewees agreed there to be value in increasing brand advertising as a source of demand. Many interviewees saw brand advertising as a potential solution for improving CPMs in mobile game in a tightening privacy landscape due to lesser need for advertising identifiers and attribution possibilities related to ROAS optimization. In addition to brand advertising requiring less granular targeting, when performance advertisements have less granular targeting abilities and produce less revenue, brand advertising could capture some of that lost value. Below are comments from the interviewed experts related to brand advertising.

Interviewee 2:

“So the first party data that's being shared right now, is basically what's most important for branding advertisers which adds revenue. It's knowing what the demographic makeup of your app is or your game right so gender split and age right because the biggest predictor of wealth is age so basically knowing as much as possible about your user base can be basically leveraged and turned into something called a brand advertising deck which means it's easier for agencies and brands to buy your inventory uh what they usually want to know is just demographic data so the more of that you can share with your network partners the more buying you'll see.”

Interviewee 6:

“...if we're selling to agencies, or directly to a brand, we know contextually that x per cent of our users are, let's say women, or a certain amount of people are a certain age... I do think it would be useful...”, “what I would like to see much more in our inventory in a few years is brand advertisements. This is since there are problems related to performance advertising, that are in conflict with our brand.” and “when [targeting] tools are being taken away from networks, and CPMs are decreasing there. Brand advertising could capture some of that value, so I see it as a solution.”

Interviewee 7:

“I would say the bigger opportunity is on brand advertising. In my books, there is a clear market discrepancy between how much time players are spending in games, of their whole mobile time, and then how much advertisers are investing into games on that side. And partly it is because the first party data solutions aren't there yet, but also some maybe old stigmas.”

5.2.3 Segmentation

Since tightening privacy legislation and requirements mainly restrict the sharing and use of personal data, most interviewees suggested some form of segmentation to be a potential solution for adding value for advertisers and publishers, without compromising user privacy. This is also reflected in the theoretical background by Pocketgamer.biz (2024). Also, in order to unlock segments, first-party data must be processed, for example through data aggregation or anonymization, which Ullah and others (2023) considered privacy compliant solutions for future advertising. However, all interviewees who saw value in segmentation for advertising purposes, also agreed that a viable,

scaled system isn't there yet, and would require efforts from the advertising industry. An example of such segmentation initiative is IAB Tech Lab's (n.d.) SDA, which we examined in chapter 3.5.3.

Interviewee 4: "I think the systems are already in place. Like, what cohorts and how the things are being built. I think that's already being well laid out. I think that also on the network side of things, it's still, they need to make sense of how this can be used in the future. So maybe this is still at, as I mentioned, at the very, very beginning."

Interviewee 5: "Right. The seller defined values, but you need a way to transmit that. You need a way to have it for the SSP, you know, included in the bid request. And then everyone needs to sort of be able to understand what that means, in a universal way. But, if you had that, that would help. That would probably on net increase CPMs."

Interviewee 3: "not really deciding on what ads to show to individual players but instead deciding on how the segment of the game player behaves and then via that, basically treating all the game players in the same way as their segments. ...it's the best the most future-proof bet"

5.3 Post-interview artefact

When analysing the expert interviews that were held, certain topics mentioned in the previous chapter stood out. These topics can be initially divided into two separate categories, those on an industry level, and those on an individual publisher level. Topics on an industry level include new channels between publishers and advertisers as well as industry-level support for processed publisher first-party data. Industry level changes are presented with a dashed line, since they require actions from other stakeholders than just mobile game publishers.

New channels between publishers and advertisers mostly refers to new programmatic channels between advertisers and mobile game publishers, which would allow for additional and different demand sources. The interviewees considered these new channels important for plenty of reasons, different targeting parameters, better player experience, potential price uplift, and potential decrease of other targeting methods in the future.

The other industry-level topic that came up in multiple interviews was the need of support for utilizing data points that are gathered through processing first-party data. This includes different taxonomies, different aggregations and potentially user-level data as long as it can't be connected to PII. What makes this an industry-level topic, is the need for standardization between advertisers and

publishers, since it would be tedious to agree on shared data points and metrics with individual partners.

The topics related to what mobile game companies can do internally include first-party data strategies and collection, as well as first-party data processing. First-party data strategies refer to strategic planning and decision making related to first-party data utilization (Latvala et al., 2022). As brought up by interviewee 1, data should not and cannot be collected without a use for it. This is one of the main cornerstones of data minimization (Pfitzmann & Hansen, 2010) Therefore companies that wish to have robust first-party data for future use, need to decide what they want to collect and what they are going to be using it for. It's also vital for mobile game companies that wish to future proof their advertising methods to consider how the desired data should be collected. In addition to being a legal question, it also requires mobile game companies to inform their players about their data usage through terms of service or privacy notices.

Data processing in this context refers to the filtering, aggregation and anonymization of data points. These are all methods that were considered to have high value for mobile game companies in the future by the interviewees. First, filtering allows for filtering out data points that are either not necessary or can't be shared in any privacy compliant way. Aggregation refers to the process of grouping data about users on a segment or mobile game level, which the interviewees considered to make sharing of potentially valuable data points compliant with privacy requirements. Similarly, anonymization of first-party data refers to processing data in a way, that it can't be used to trace or recognize individual users. Examples of this include PII hashing and pseudonymization.

The pre-interview artefact also included a solution for higher CPMs: "enriching bid requests with additional contextual data". This was however changed moving from the pre-interview artefact to the post-interview artefact. Since the experts didn't consider adding more raw contextual data points to bid requests privacy compliant or possible, that solution has been removed from the artefact. Also, interviewee 5 considered the main problem for mobile games using contextual data to be the lack of different contextual environments within the games, compared to news sites for example, with different news categories that can be used as context for advertising. (Fischer, 2020) There is some overlap with the removed solution and data processing, since additional data points, including contextual, could be utilized if they can be aggregated or anonymized further. Therefore, the possible aspects of the removed solutions are now included within the data processing solution.

The interviewees considered the previously mentioned methods to potentially have higher value for publishers. The two main benefits from these methods were the potential acquisition of previously

scarce brand advertising demand, as well as higher CPMs through networks. These results are presented as the right-most blocks of the figure.

It's worth noting, that most of these solutions and topics brought up by the interviewees aren't compatible with both ATT and GDPR. Since most of these proposed solutions are compliant with ATT, but not with GDPR, the post-interview artefact will highlight parts which are compliant with GDPR or achievable without user consent with an asterisk. All of the proposed solutions included in the artefact are compliant with ATT.

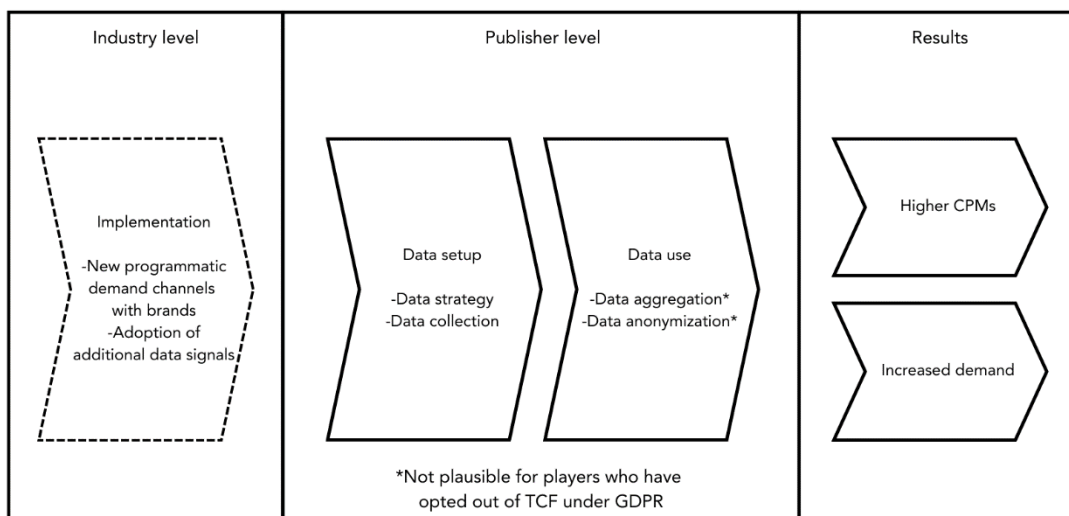


Figure 12 Preliminary post-interview artefact

6 Artefact evaluation

During this research, the artefact won't be able to be demonstrated in a real-world context like Peffers and others (2007) described in the design science research methodology process model. However, this research will move on to the next part of the process model, which is evaluation. In this step of the process, a part of the previous interviewees will evaluate whether the designed artefact accurately depicts the problem environment, as well as its solutions. The group of previous interviewees will consist of 3 interviewees, Interviewees 1, 6 and 7.

The three interviewees will be shown the post-interview artefact presented in chapter 5.3. They are asked for feedback regarding the representativeness and correctness of the artefact and whether they consider it to need changes. After the evaluation interviews are done, another iteration is made regarding the artefact's design, and potential corrections are made according to the experts' feedback.

Interviewee 1 considered the artefact representative of the problem environment, as well as correct. However, they highlighted that also personal data collection, whether shared to third parties or not, should also be considered a topic with different interpretations. Therefore, in the publisher level of the artefact, data collection will also be amended with an asterisk to highlight the room for interpretation.

Interviewee 6 considered the artefact to accurately depict the problem environment and considered the proposed solutions to be correct. They did not suggest any changes to the presented artefact.

Interviewee 7 considered the problem environment to be correctly depicted by the artefact, but thought the first of the two industry-level solutions was a bit too ambiguous. They highlighted that programmatic advertising channels where brands can purchase inventory from publishers already exist. Instead of the existence of these channels being the problem, the lack of support for wider brand advertising integration to games and lack of measurement tools within the programmatic channels is the key hurdle for brand advertisers regarding mobile game inventory buying.

According to this feedback, the field will be changed from "New programmatic demand channels with brands" to "better brand advertising support for mobile game inventory buying". In addition, since these potential support methods for brands may also benefit from additional data sharing, the "adoption of additional data signals" is moved above to signal the importance. Finally, the formatting of the artefact was changed for visual clarity independent of interviewees' feedback, while keeping the text fields unchanged.

6.1 Final artefact

The final artefact now includes actions that can increase publisher ad inventory value, as well as presents results of the actions. First, on industry-level actions, standardized support for additional data points in the form of processed data is presented as “Adoption of additional data signals”. Second, on the industry-level actions, providing brand advertisers with purchasing tools for games inventory and measurement possibilities is presented as “Better brand advertising support for mobile game inventory buying”.

Second, in the middle column that represents actions that publishers can take to increase their advertising inventory value includes two separate blocks, data preparation and data processing. Data preparation includes actions a mobile game company must take before being able to use their data for advertising purposes. These actions include data strategy and data collection. Data strategy refers to top level planning regarding the use cases for collected data and which data points will be collected. Data collection represents the actions for collecting data according to the data strategy. The second block represents utilization of the collected data by processing it. The first method of utilizing the collected data is data aggregation, which aims to create segment or audience level data points that don't conflict with data privacy demands. The second method of utilizing the collected data is data anonymization, which includes anonymizing personal data points and reducing the amount of data points tied to the bid requests to ensure they can't be connected with other data points, for the purpose of tracking the player.

Finally, the bottom column represents the results these actions produce. The first result is higher CPMs for the inventory due to better targeting capabilities. The second result is increased demand, which reflects better purchasing methods for brands. Since increased demand sources also have a positive effect on auction CPMs, an arrow from increased demand to increased CPMs is added to indicate contribution.

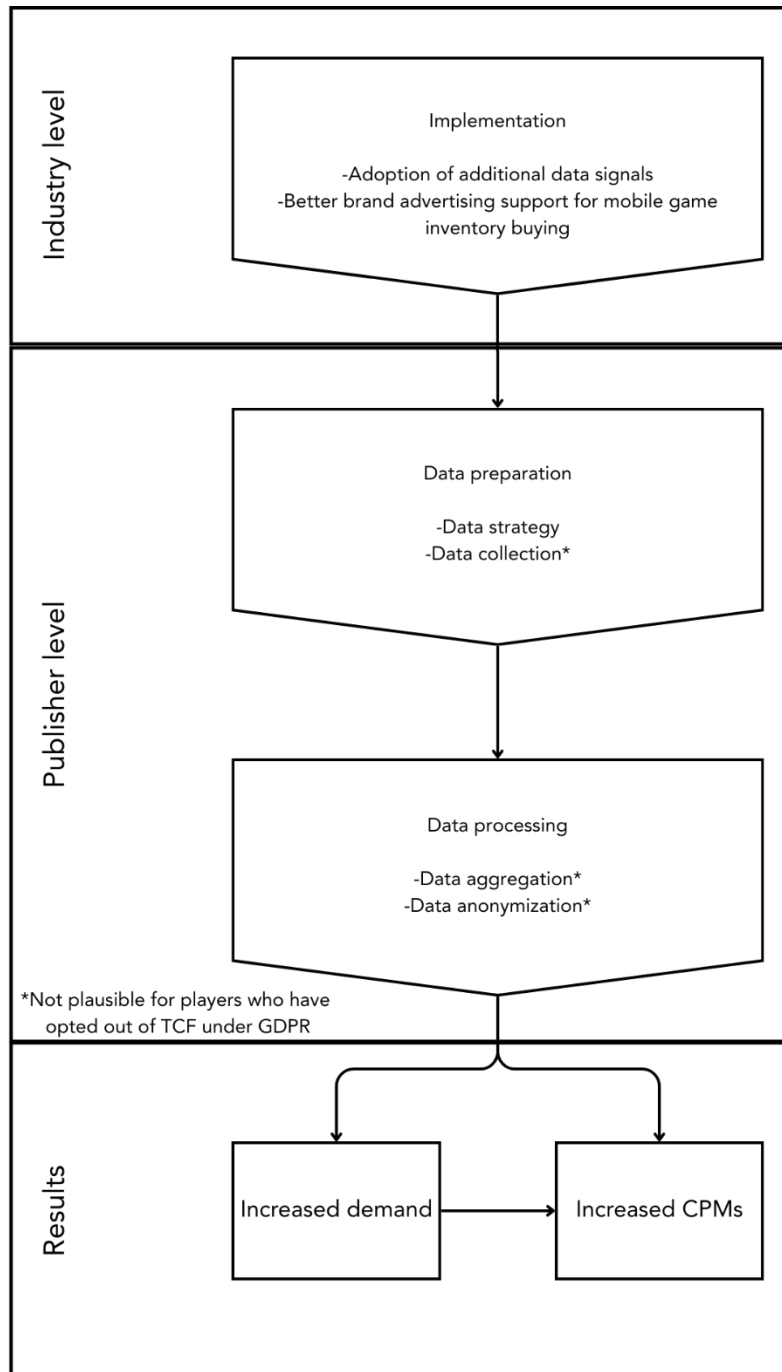


Figure 13 Final artefact

7 Conclusions

This research has aimed to answer the research questions presented in chapter 1. The main research question is “How can mobile game companies maximize ad impression values for players that opt out of tracking, while being privacy compliant?”. To summarize how synthesis from the theoretical background and the expert interviews answers this main research question, mobile game companies themselves have very limited tools for affecting their advertising impression values when players opt out of tracking. It’s evident that mobile game companies must collaborate with other actors in the mobile advertising ecosystem to unlock additional value. These can be different actors, such as networks, SSPs, mediation platforms, DSPs, or advertisers. This research recognized two main areas through which publishers’ advertising inventory values could be increased, unlocking additional demand and using publisher first-party data for privacy compliant targeting.

The research sub-question 1 is “How can mobile game companies collect and utilize first-party data for advertising purposes?”. The summarized answer is that mobile game companies must follow data compliance requirements set by legislation and operating systems. If a player has opted out of tracking, mobile game companies have very limited means for sharing their data. The restrictions depend on whether the player opts out of tracking through ATT or TCF. Data collection rules and legislation is less strict compared to data sharing, but under specific legislations, such as the GDPR, personal data collection is also subject to consent.

The research sub-question 2 is “What privacy compliant solutions are expected to be used in the future in mobile game advertising?”. This question is largely answered by the produced artefact. First-party data as well as its processing is vital for succeeding in future mobile advertising. Through first-party data use, mobile game companies can anonymize and aggregate their player data so that it may be used for advertising targeting without jeopardizing the players’ privacy.

There are limitations to this research. As mentioned in chapter 4.1, this thesis won’t be going through all the iterations in the design-science research methodology process model. The demonstration and its evaluation are outside the scope of this thesis, since implementing the changes portrayed by the artefact would require major efforts within the real mobile advertising ecosystem. Also, since there are plenty of intertwined topics related to this thesis, changes to any of them may affect the plausibility of the artefact and the solutions presented in this thesis.

The produced artefact includes information that mobile game companies can build their privacy compliant advertising operations around. It can be considered a top-level guide for mobile game

companies on how to navigate the privacy landscape while mitigating advertising inventory value decreases. There's plenty of literature related to the separate topics of this thesis, e.g. mobile game advertising, data privacy, first-party data, and privacy compliant advertising solutions. However, since there's a research gap in literature that combines all the mentioned topics, this thesis contributes to the knowledge base by shedding light on how these facets interact with each other in this unique advertising ecosystem.

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