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Consumer Attitudes towards online mobile advertising formats

Rogério Coimbra Henriques Lopes Dias

Master in, Computer Science and Business Management

Supervisor:

Doctor Adriano Martins Lopes, Invited Assistant Professor

ISCTE-IUL

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TECNOLOGIAS
E ARQUITETURA

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Resumo

As empresas de publicidade online utilizam principalmente a publicidade direccionada. É um sistema que utiliza dados dos consumidores como o histórico dos motores de busca, interesses e informação demográfica para compreender melhor que produtos ou serviços os consumidores poderão querer a seguir, de modo a poderem optimizar o anúncio. Mas saber qual o produto que o utilizador quer a seguir ou acha interessante pode não ser suficiente. A forma como o anúncio é entregue é também relevante, uma vez que os anúncios móveis podem ser implementados em muitos formatos, como banners ou anúncios em vídeo, e em muitas plataformas, como aplicações móveis, motores de busca ou websites móveis. O formato em que os anúncios móveis online são apresentados é muitas vezes ignorado e deixado aos marketers para decidir.

Apresentamos uma análise exaustiva dos formatos de anúncios e plataformas de publicação existentes, nas quais tais formatos podem ser apresentados. É evidente que alguns formatos de anúncios são mais eficazes e mais adequados para as empresas utilizarem do que outros. Os formatos de anúncios mais eficazes entre os que foram analisados são os anúncios de compras de produtos apresentados em motores de busca, e anúncios do formato carrossel em aplicações móveis. O resto dos formatos de anúncios foram objecto de revisões mistas ou muito negativas. Além disso, verificou-se que os utilizadores em geral preferem receber anúncios na plataforma de publicação motores de busca, e em certos formatos de anúncios a eficácia pode ser distinguida através da utilização de informação demográfica do consumidor.

Palavras-Chave: Anúncios online; Publicidade direcionada; Marketing em telemóveis; Formatos de anúncios online.

Abstract

Online advertising companies rely primarily on targeted advertising. It is a system that basically uses consumers data like search engine history, interests and demographic information to better understand what products or services consumers might want next, so to be able to optimize the advert. However, knowing what product the user wants next or what he or she finds interesting might not be enough. The way the ad is delivered is also relevant as mobile adverts can be deployed in many formats, like banner or video ads, and in many platforms, including mobile applications, search engines and mobile websites. The format in which mobile online adverts are deployed is often overlooked and left to companies or marketers to decide.

We present a thorough analysis of existing ad formats and publishing platforms in which such formats can be presented. It is clear that some ad formats are more effective and more suitable for companies to use than others. The most effective ad formats out of the ones that have been analyzed are showcase shopping ads and product shopping ads presented on search engines, and carrousel ads on mobile applications. The rest of the ad formats were getting mixed reviews or very negative ones. Furthermore, it was found that users generally prefer to receive ads on the search engine publishing platform, and in certain ad formats the effectiveness can be distinguished through the use of the consumer's demographic information on the receiving side.

Keywords: Online Mobile Advertising; Online Mobile Advertising Formats; Data Analysis; Digital Marketing;

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Chapter 1 – Introduction

1.1. Research theme

Advertising has been around for as long as there have been goods to trade and a medium to talk about them. It took a leap forward with the appearance of the printing press and movable type in 1447, but it was in the mid-19th century that the advertising industry started taking its shape with the industrial revolution and the rise of the newspaper as a mass medium. Indeed, the industrial revolution meant that things could now be mass produced, while the newspaper could also advertise these consumer goods to a larger audience of potential consumers [1]. From then on, advertising platforms have evolved and changed, in particular from newspaper, radio, television to internet [12]. With the rise of internet usage by consumers the shift towards an online presence had to be made in many industries. Advertising was paramount to achieve that.

On the other hand, mobile phones with access to the internet brought another level of accessibility to consumers. Companies can now connect with them virtually any time of the day through mobile apps, mobile websites, search engines and platforms as those available in modern smartphones [14].

This dissertation will focus on online mobile advertising and its many formats of conveying information via smartphone. Finding a relation between user demographics and feelings towards advertising formats such as banner ads, video ads, etc. will be a major goal in this research work.

In the remainder of this Chapter, we lay out a more detailed overview of the problem we are working on so the research goals we are setting out. Then, we introduce a methodological approach to pursuit our goals and, finally, we present the way this document is structured and organised.

1.2. Problem and research goals

Mobile advertising companies rely primarily on targeted advertising [23]. To do so, they use data about people like their search engine history, interests and demographic information in order to understand what people want next and to optimize the advert according to their best interests [22]. In the end, by figuring out a better user experience with the ads alongside a higher click rate, they aim to create a win-win situation [2]. However, knowing what product the user wants next or what the user might find interesting might not be enough. The way the ad is delivered is also relevant as many studies have concluded [3] [4] [5]. Notice that mobile adverts can be deployed in many formats, like video ads, banner ads, text ads, and in many platforms,

such as mobile apps, search engines or mobile web browsers [12]. The format in which mobile online adverts are deployed is often overlooked and left up to the marketer's choice, and it can have a negative effect on company brand images and marketing campaigns [5]. Studies have found that certain segments of consumers tend to find different mobile ad formats irritating [3] [4]. Preferences in format and their subsequent success, could be predicted based on the consumers demographic information, general pre-dispositions, etc., just like for example targeted advertising uses this information for future products [23].

On that basis, there is a first stage to validate that consumers preferences in mobile display advertising formats are important for the effectiveness of ads. Once that is done, it follows the creation of costumer profiles using their personal traits, pre-dispositions, demographic information, etc., filtered by their advert format preferences. The final part of the work is the formulation of a systemization model using the previously acquired information. Such model is set to provide a blueprint on mobile display advertising for online advertisers.

1.3. Methodological approach

In research, as in many working areas, it is critical to establish a working framework to carry out the tasks and to accomplishing goals.

Hence, we elect a quantitative research to validate the importance of the format in which online advert is presented, in accordance to consumer preferences and demographic information. Furthermore, we set out right from the beginning which research hypothesis we are dealing with and want to test.

The quantitative data collection method we are using is a questionnaire, which is to be deployed in a major paid survey website, in this case Survey Monkey [6].

The questionnaire is built and spread on Survey Monkey where users will convey their attitudes towards each online mobile advertising format.

Once the raw data is collected, there will be an initial data visualization process and data reliability testing. These tasks will rely primarily on Survey Monkey integrated data tools and on the Statistical Analysis Software SPSS. Basically, at this stage, we will be drawing graphs and tables that summarize the answers from the correspondents of the survey and to establish a starting point for further data analysis and conclusions. For instance, we will use Cronbach's Alpha as a measurement model to estimate the reliability of the data collected in the survey.

After the reliability testing and an initial data summary is laid out, it follows the creation of user profiles. Such task relies on personal traits and pre-dispositions, filtered by preferences in the formats of adverts, all depending on the information acquired in the

survey. In order to create these profiles, we will be performing clustering analysis, using machine learning algorithms, such as the K-means algorithm, which is very common in data analysis.

Most tasks related to data analysis are carried out having as a main platform the Jupyter Notebook platform and the Python language, alongside all the libraries that are part of such eco-system.

In the end, with the formulation of a systemization model using the information acquired, we aim to provide a blueprint on mobile display advertising for online advertisers. Hopefully, this may help companies and marketers in adjusting the format of advertising deployed in the internet to the customers preferences.

1.4. Dissertation outline

This dissertation is organized into five chapters. That is, apart from this Chapter that introduces the research theme and provides an overall overview of the problems we are facing and the methodological approach to be followed, there are four more chapters.

The second Chapter – Related Work sets out how mobile advertising is used in the world and the importance of mobile advertising in specific. It then passes on to describing what online mobile advertising is in detail and explaining the basic concepts of targeted advertising and personalization. Then the link between attitude towards an advert and effectiveness in advertising is uncovered.

Then, Chapter 3 – Research Framework provides the hypotheses that this research will set out to test and lays out the research design upon which this research will be conducted. It sets how to tackle the hypotheses testing, where the choice of a quantitative research is justified, and issues like philosophical worldviews, survey design, population and sample size and data analysis are explained in respect to the research work of this dissertation. Furthermore, a mobile advertising formats taxonomy is established so there is a standardization of the mobile ad formats studied in this research.

Chapter 4 – Model Analysis presents the main findings of this research. It starts by revealing the test scores of the data reliability test and a brief summary of the data that was gathered. Then, it is followed by an analysis of each ad format and how they performed, leading to the hypotheses put to the test. Moreover, data clustering was performed on two ad formats, and finally a table is presented summing up the results and recommendations of this research.

Finally, Chapter 5 – Conclusions presents the main conclusions of the carried out research. It reveals the contributions to the academic and corporate world, the research constraints we

have encountered during the research, as well as pointing out further research that should be considered. The chapter ends with an important personal note on privacy by the author.

Chapter 2 – Related Work

2.1. Mobile advertising

Mobile advertising has been defined in many ways by different companies and institutions over the years. According to the Mobile Marketing Association (MMA, 2009) mobile marketing is a set of practices that enables organizations to communicate and engage with their audience in an interactive and relevant manner through and with any mobile device or network. Also, the Interactive Mobile Advertising platform [7] defines it as the business of influencing people to buy services and products using a wireless channel to deliver a advertising message.

The work in [8] carried out a comprehensive mobile advertising literature review. In there, it was concluded that, despite the several different definitions given by academicians as well as practitioners and industrial associations, most of these definitions indicate that mobile advertising is the utilization of a mobile platform including networks or devices to deliver advertisements. This definition includes not only handsets but also tablets and a whole array of devices that possess mobility and portability. The authors also factored in the fact that some researchers consider mobile advertising a subset of mobile marketing while others use it interchangeably.

Hence, there is no conceptual agreement about the definitions of mobile marketing or mobile advertising. But throughout this thesis we understand mobile advertisement as the way Interactive Advertising Bureau defines it: "advertising tailored to and delivered through wireless mobile devices such as smartphones, feature phones (e.g. lower-end mobile phones capable of accessing mobile content), and media tablets. It typically takes the form of static or rich media display ads, text messaging ads, search ads, or audio/video spots. Such advertising generally appears within mobile websites (e.g. websites optimized for viewing on mobile devices), mobile apps (e.g. applications for Smartphones running proprietary or open operating systems), text messaging services (i.e. SMS, MMS) or within mobile search results (i.e., 411 listings, directories, mobile-optimized search engines)". Notice that this definition is not only recent and up to date in terms of technology, but it is also clear on the definition of what mobile devices are supposed to deliver in relation to advertising messages. Also, it provides layout of the different formats and examples of what they are composed of.

Mobile advertising platforms and the underlying technologies have been evolving over the years from SMS and MMS to touch screen mobile phones, mobile phone applications and 3G and 4G technology [8]. The switch in platforms is noticeable as most prior mobile advertising

research had a big emphasis on SMS advertising because touch screen phones and new technologies mentioned above were not around at the time or in mainstream use.

If one looks back, according to [9] the development of 3G networks brought the ability to send and receive images, audio and videos on mobile phones. Such new formats alongside the mobility provided by handsets have make path to new and more creative advertisements. The work in [10] identified two types of mobile advertisement based on the technology channel used to deliver the advertisement, single channel and hybrid channel. Single channel was based solely on mobile technology network, characterized as older generation mobile phone with no possibilities of connecting to the internet. Calls, MMS and SMS as the main ways of communication is a good example of single channel usage. On the other hand, hybrid channel consists of internet channels and mobile network technology. Modern smartphones are examples of using hybrid channel.

The work in [11] also categorized wireless advertising in two categories: push and pull advertisement. Push advertisement consists of sending or 'pushing' advertising messages directly to customers and consumers alike, typically an SMS or a push notification from a mobile application. Alternatively, pull advertisement involves placing advertisement on potential browsed content. This type of advertising messages is very common on the internet when people search on via a search engine, browse a website or open a mobile application. Indeed, there are regularly advertisement messages on the way. Note that when wireless advertising is mentioned it is not referring to the commonly known wireless internet but to advertising done on mobile (wireless) devices. Thus, it also includes old phones with only basic network capabilities like calls and SMS/MMS.

This dissertation will solely focus the newer and more relevant generation of mobile advertising, following the logic of the [12] definition. That is, the internet mobile advertising is comprised of mobile websites (e.g. websites optimized for viewing on mobile devices), mobile apps (e.g. applications for Smartphones running proprietary or open operating systems) and mobile search results (e.g. listings, directories, mobile-optimized search engines). Thus, we drop text messaging services (e.g. SMS, MMS) from the study.

According to the Interactive Advertising Bureau (IAB), the annual growth of internet advertising market share in the United States of America has exceeded that of other advertising media, having experienced double-digit annual growth in every year from 2010 till 2017. No other media has experienced double-digit growth in any of these years, even surpassing television advertising in 2016. Indeed, it is the biggest form of advertising in market share value since then [12].

In Europe the advertising market underlies the same trend. Online advertising in the European Union (EU) took the lead for advertising expenditure in 2015, surpassing advertising spend (ad spend) on television for the first time. The total advertising market grew by 14% in the period 2011 to 2016, from € 88.8 billion to € 101.3 billion. It was mainly driven by online advertising, which almost doubled in that time period [13]. And in the first half of 2018 the digital advertising spent [14].

The shift from desktop to mobile advertising in recent years has also been increasing at a high rate, with a 5-year compound annual grow of 71.4% for the period 2012-2017. Mobile advertising has surpassed desktop advertising in revenue for the first time in 2016, so being now the leading platform in internet advertising [12].

On the other hand, in Europe, while still not the leading platform, mobile advertising has been growing significantly. In the first half of 2018 it was approaching a 50% share of digital ad spend while surpassing the € 10 billion range for the first time. Also, mobile advertising exhibits similar trajectories both in Western Europe and Central/Eastern Europe. These are trajectories of growth as seen in previous years [14].

This mobile growth seen in the western world is mainly due to the high smartphone usage and accessibility that these developed countries have experienced. Indeed, the amount of unique mobile subscribers in Europe in 2017 was 85% of the population and it is expected to reach 88% by 2025. Furthermore, 42% of total mobile communications in 2017 were done using 4G and this number is expected to reach 63% by 2025, which puts emphasis on the key word mobility [15]. Marketers can now reach millions of customers that are accessible anywhere anytime, since mobile advertising counters the restraints of fixed-line internet access.

Another aspect worth considering is the source of this digital advertising and the current players in this market. According to [13] the online advertising industry is a duopoly hegemonized by two tech companies, Google and Facebook.

A report by [16] from EMarketer, which is a reputable company that covers every major topic related to digital marketing, states that this duopoly is dominating the digital advertising market in 2019, with over 50% market share in ad spend in the United States alone. These two companies will not turn away from being the biggest players in the digital ad space any time soon and have been leading with over 50% in ad spend market share in the United States for the last 4 years.

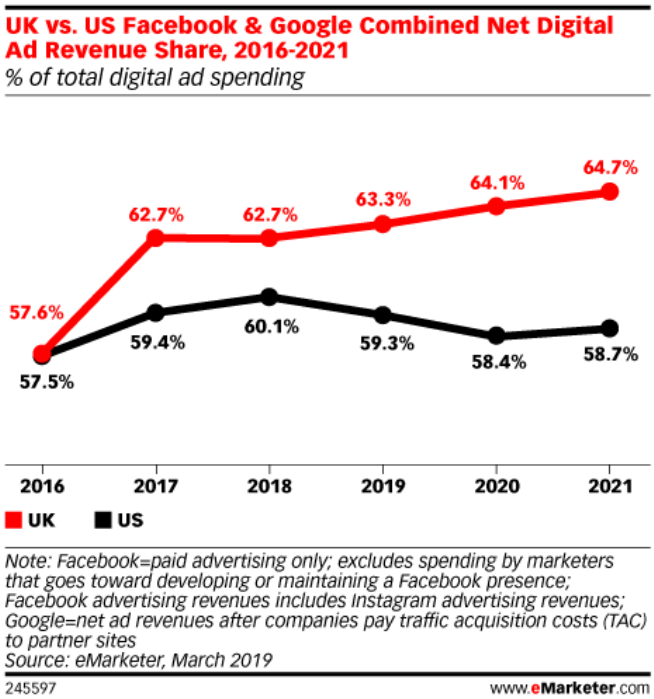

Figure 2.1 - UK vs US Facebook & Google Combined Net Digital Ad Revenue Share 2016-2021

In the United Kingdom, Europe's biggest advertising market by ad spend [13], the trend is similar. The digital advertising ad spend share that Google and Facebook have is even bigger than in the United States, reaching almost 63% of the market in 2019 and expecting to reach 64% by 2021 [17]. Figure 1 depicts such market shares.

Mobile advertising makes most of the duopoly ad spend market share. More than half of Google US revenue is from mobile adverting and Facebook follows the same trend, with more than 80% of US revenue coming from mobile advertising in 2017 [18].

Again, Europe follows the same lead. In Germany, the second largest market by ad spend in Europe [19], around 73% of the digital advertising ad spend was dominated by mobile advertising and this number is predicted to reach 79% as early as 2021 [20].

Overall, Google and Facebook dominate de Digital Advertising industry, with Google being the world's largest digital advertising company in the world. Google not only provides the number one web browser, mobile platform and search engine worldwide, but also has over three billion monthly active users on their map, video and email applications [21]. For this reason alone, this dissertation will focus mainly on many business processes, ad formats and the overall online advertising strategy from Google.

2.2. Targeted advertising and personalization

Internet advertising gained traction in recent years because, unlike other types of advertising, it can identify individual costumers and analyse their behaviour. On that basis, one can focus on a particular online market segment and to target a group of costumers based on their location, interests and the demographic profile. Another aspect relates to the interactivity of internet advertisements, which allows the media audience of interest to respond to a particular advertisement of their preference [22]. The work in [23] stated that personalized advertisements are twice as effective as impersonal advertisements. In conclusion, internet advertising can hold a vast amount of customization and insights that other media platforms lack of.

Targeted advertising is the tool that allows the customization of ads for a particular online market segment. According to [24] it is defined "as the automated and specific alignment of any advertising media according to different parameters. It enables the optimized delivery of digital advertising at defined audiences e.g. target groups minimizing losses due to waste coverage. Targeting increases the efficiency of advertising campaigns, while at the same time delivering more relevant ads to the customers".

Targeted advertising is part of various personalization strategies in Electronic Customer Relationship Management (E-CRM), with the objective of aligning marketing campaigns to an individual costumer thus acknowledging the costumer's individual preferences and inclinations. While personalization comprises targeted advertising, content targeting methods and product recommendations, the term personalized is also used by marketers as one to one advertising and individualized advertising in a narrower sense [24]. The work in [25] considers personalization more individualized than targeted advertising, which only partitions costumers into a particular segment in the market. While targeted advertising aims at a group of people with common interests, personalization aims at just one person. This dissertation will be focusing on targeted advertising, so personalization will be considered a broader term of targeted advertising, considering targeted advertising part of a personalization process.

According to [24] there are several types of targeted advertising. In this dissertation we will focus on two of them, the Sociodemographic Targeting and the Predictive Behavioural Targeting. These types of advertisement are popular topics amongst marketers and are at the core of the objective of this work, which is to find an association between preference in ad formats and demographics.

Sociodemographic Targeting consists of targeting consumers based on indicators like age, gender, nationality, salary, etc. These indicators can be accessible because the user conceded

the information himself by registering on a certain service or can be accessible through Predictive Behavioural Targeting. By using statistical predictions, the methodology is able to fill in gaps of a user profile, whether relying on statistical analysis applied to external data, past questionnaires or general past behaviour so giving a hint on user demographics.

According to [24] the process of developing a personalized system can be divided into three steps, tracking, profiling and matching. The first one, tracking, consists of the data gathering phase, whereas profiling is where the data is analysed, and finally matching is the process of aligning advertisements, products or services with a segmented user profile.

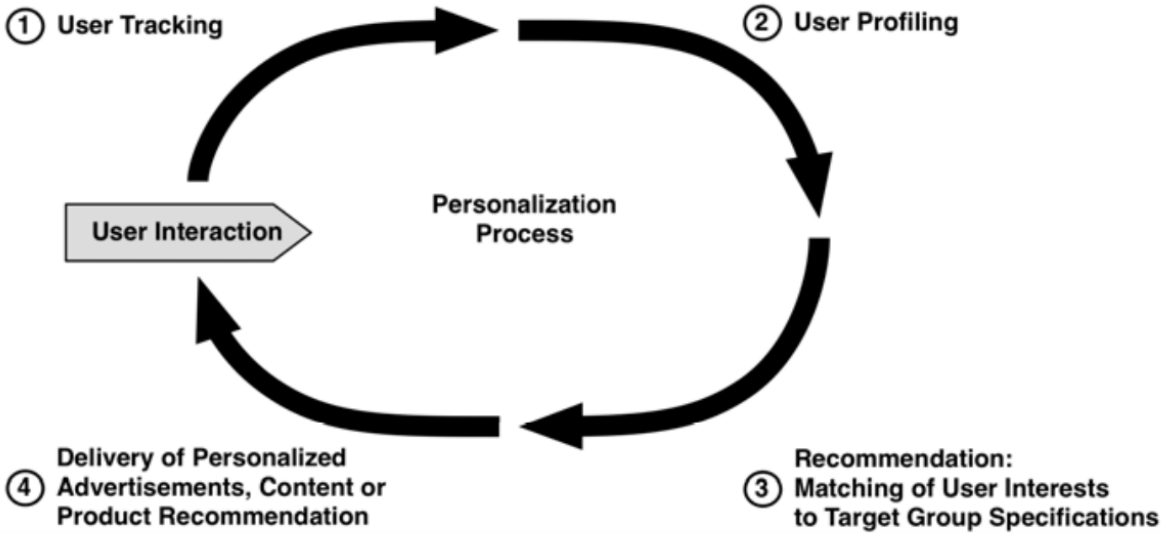

Figure 2.2 - Generic Personalization Process [24]

Tracking is the phase that involves logging all the useful user data, either entered by the user, provided by other systems or bought from external suppliers [24]. Usually these suppliers are advertisement companies and businesses alike partner with publishers and social networking websites (e.g. Google, Facebook, Twitter) that are able to reach the biggest number of customers possible [26] since these platforms have more data and daily users than most companies.

Platforms like Facebook have access to a prosperous amount of consumer information like demographics, interests, past behaviours and future activities [23], Facebook leverages their high user base and uses personal information while tracking usage on the platform to be able to personalize better adverts for each consumer.

Just like Facebook, Google has a variety of ways to collect user information [21], it gathers information when users use their services directly, when they log in to their applications such as Gmail, YouTube, Search engine or Drive for example, this is called their “active” that gathering, this method refers to when the user is deliberately using their platforms but there are

less conspicuous ways used by google when tracking users where applications hoard information without the user's knowledge. This passive data collection from google comes from widely used proprietary platforms like Android or Chrome, applications like Maps or YouTube and Publisher and Advertising tools such as Google Analytics or AdSense. Even when using an IOS device and not using any google application or service it was found [21] that google keeps receiving and hoarding data in their servers, this is due to their popular Advertising/Publisher tools that many non-related websites and applications use to make profit, since there are ads run by google in these pages the company can still get some information.

These multinational companies are specialized in targeted advertising since they have the biggest and more detailed data gathering in the world, collecting people's online and real-world behaviours logging user usage and personal information on their databases.

While personalized advertisements are sought-after, favoured and used by marketers and companies in order to sell their products and services [22], its disadvantages cannot go unnoticed, privacy is now a growing subject and according [27] "Higher degrees of personalization, such as adding personal identification or transaction information to browsing data, increase feelings of intrusiveness, and negatively affect purchase intentions." proving that consumers are aware that their information is being used and becoming more and more averse to it. Companies buying and selling data is also another privacy issue, medical data is now a multibillion-dollar industry [28] and data brokers are lacking transparency and turning personal information into a commodity [29].

In light of this lack of transparency from companies in what concerns consumer's private data European Union pushed regulation through the General Data Protection Regulation (GDPR) in European Union law promoting data privacy for all individual citizens giving them control over their personal data, this regulation gives limited flexibility for companies in this region since from 2018 on companies have to have individual permission from its users before they can use their personal information to improve ads for example given the context of this thesis, in the United States there is less regulation and consequently more business opportunities in this department of personal data and advertising personalization [30]. Data gathering can be a sensitive topic, but it is an imperative phase in the personalization process.

The profiling phase consists of processing, analysing and organizing the acquired data. The data is organized and structured by analysing user behavioural patterns, interests and demographics in order to create a segmented user profile, the user is assigned predefined categories like interest for a certain sport or practice for example [24].

The final phase of personalization is the matching process, this phase involves matching a user to a group of users that have identical behaviours and interest, and then matching this group with an advertisement of a service or a product. These services or products have been previously categorized by marketers so it's possible to assign a target group to them.

During these stages of the Targeted advertising process data mining techniques are usually used to find patterns, create user profiles, find clusters of consumers that have identical behaviours etc. [31], without these techniques it wouldn't be possible to scan large data sets automatically and without human intervention. The work in [32] even considers Targeted advertisement as the embodiment of data mining technology in web services.

Data mining refers to the extraction of fruitful information from raw data, this software engine finds interesting patterns in large scale databases without requiring human intervention. Data mining is comprised of four crucial relationships, classes, clusters, associations and sequential patterns. Classes consist of using previously stored data to find information on specific groups, an online store using user data to know what consumers usually buy on the store and at what times are they most likely to visit. On clusters data items are grouped by logical relationships or consumer preferences, this technique can be used to find market segments and consumer affinities. Associations on the other hand is when data is used to find valuable associations, an example would be stores trying to find out if there is a relation between two items in consumer purchase behaviour. Finally, sequential patterns that refers to data being mined to predict future behaviour patterns and trends [31].

Out of the four data mining relationships costumer clustering is the main data mining methodology in digital marketing and is used in the matching phase to find and create groups of users with the same behaviour profiles since it can find and assign multiple data points that share the same properties to a group all while learning unsupervised [31].

2.3. Consumer attitudes and effectiveness

According to [33] advertising effectiveness pertains to how well an advertising campaign achieves its communication objectives, the measurement is typically done by qualitative or quantitative market research. This research is usually done through indicators like consumer purchase intention towards the advertised product or even brand in general. Brand awareness and purchase intentions, while not the only factors considered when doing a proper advertising effectiveness measurement, are crucial in the control of the advertising process.

Attitude toward advertising "is defined as a learned predisposition to respond in a consistently favourable or unfavourable manner toward advertising in general." [34]. A link

between Attitude towards advertising and effectiveness has been reported by [34] with the creation of the attitude toward the ad (Aad) theory that relates attitude towards advertisement with brand attitude and purchase intentions. In internet advertising this theory holds up in several studies with [35] reporting a connection between attitudes towards internet adverts and intention to buy the product or service advertised. It is then possible to say that measuring consumers attitudes towards an ad is very important for companies and marketers since this gives them insights on how effective the marketing campaign is going.

Since attitude towards the ad is so important when accessing the effectiveness of the ad, this thesis will focus on consumer attitudes towards advertising formats to find which formats are more effective to which demographic group.

An understanding of the underlying factors influencing consumer attitude is needed to measure consumers attitudes towards advertising. On an article about web advertising [36] it was found that there are three factors that affect consumers perceived value towards an ad: Informativeness, Entertainment and Irritation. It was also uncovered that consumers perceived value of an advertisement influences their general attitude, confirming that Attitude toward the ad is dependent on ad value.

The work in [37] validates [36]'s model and enhances it by adding Credibility to the mix. This factor was referenced before in [34] and is surprisingly important having an independent effect on brand attitude and attitude towards the ad. Furthermore [37] proves that consumer demographic variables such as gender and a student's major have an impact on attitudes toward advertisement, which is positive for this dissertation since finding demographic clusters of consumers attitudes towards different formats of mobile advertisements is the objective and this is an indication that there are truly differences in attitude relative to the demographic stand point.

Another factor that is important to measure consumer attitude towards the ad is Interactivity. Several articles [5] [38] found that Interactivity has a positive impact on attitude towards the ad and enhances ad value.

Informativeness refers the quality, relevancy, convenience and timing of the information conveyed in the advert [36]. A company's ability to inform with value as an impact on how consumers perceive the company and its products. Informativeness is a fundamental factor in the consumer acceptance of the advert.

Entertainment concerns pleasure and involvement during interaction with computer-based media [39]. The audience's need for escapism, diversion, aesthetic enjoyment, or emotional release, can be satisfied by Entertainment in advertising [40].

Irritation in this context is defined by [36] as "when advertising employs techniques that annoy, offend, insult, or are overly manipulative, consumers are likely to perceive it as an unwanted and irritating influence.".

Credibility of advertising is the consumers perception of the correctness, truthfulness and believability of an advertisement [34].

Interactivity consists of giving more control of the mobile advertising experience to consumers by assigning them with a different array of choices, providing high degree of cognitive involvement, vivid communication experience and a feeling of two-way communication [38].

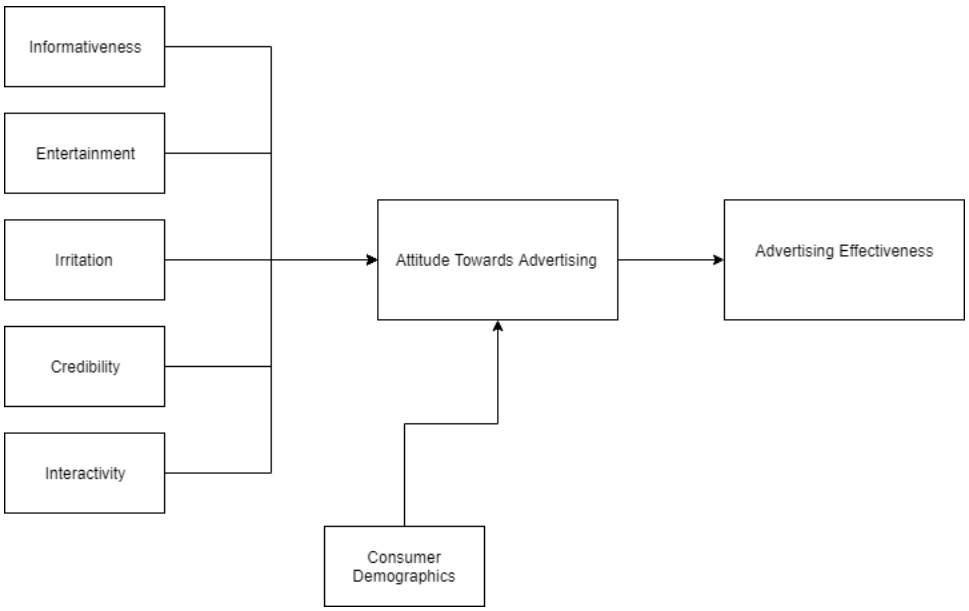

Figure 2.3 - Advertising Effectiveness Framework

These factors are not only an important indicator of attitude in web advertising [36] [37] but also, in mobile advertising, several studies [41] [42] [43] [44] [45] [46] [47] found that Entertainment, Informativeness, and Credibility affects consumers attitudes towards mobile advertisement positively while Irritation is negatively connected with overall attitude towards mobile adverts. Interactivity was also found to have a positive impact on attitude towards mobile advertising [38].

As depicted in Figure 2.3, Informativeness, Entertainment, Irritation, Credibility, Interactivity and Consumer Demographics will be the variables used in this work since they are essential indicators to measure attitude towards the ad and thus effectiveness of the ad.

2.4. Mobile advertising formats

Mobile advertising formats have been categorized by the Mobile Marketing Association (MMA) an institution that creates mobile advertising guidelines [48], recommendations and standardizations of mobile advertising elements such as ad sizes and units [49]. This organization segments mobile advertising in five different categories [48] which are Mobile Web, Messaging, Applications and Mobile Video and TV, and within these categories there are several formats of adverts.

In Mobile Web the banners and the text taglines are the common formats, banners are promotional still images that are coloured or black and white in case the WAP 1.0 Banner that is catered to older models of mobile devices, banners are used for mass market campaigns since they versatile and can be deployed in virtually any phone model with internet access just like the text tagline.

Messaging is comprised of SMS and MMS advertising formats and these won't be taken into consideration in this thesis since the scope will be only online mobile advertising.

Continuing into the Applications category the formats are firstly In App Display Units, which are basically banners in Mobile Applications instead of websites or the web browser, Integrated Ads that are formatted to be well matched with the application and integrated with it and lastly Branded and Sponsored Mobile Application which are related to the campaigns of downloadable applications that publishers want to make known.

Finally, Mobile Video and TV present a different array of formats starting with Linear Ad Breaks which consists of interrupting a streamed or downloaded video with a static image, a brand logo or a short video advertisement that takes up the whole display, this interruption can occur pre, mid or post video. There is also the Non-Linear Ad Break format which instead of taking up the whole display like Linear Ad break it shares the display with the streamed or downloaded content. The last format within Mobile Video is the Interactive Mobile Video and TV ad which allows the consumer receiving the ad interact with it by clicking, browsing or zooming.

Although there are institutions like the Mobile Marketing Association (MMA) setting guidelines, types and formats of mobile advertising the biggest company in the online mobile advertising industry, Google, is creating, developing and standardizing its own formats to present to publishers. Googles mobile ad formats are described in Table 1 [50].

Table 2.1 - Googles mobile ad formats

Format	Description
Text	Words only. *
Image	Static or interactive graphics. Animated ads in .gif and Flash format can be used.
App promotion ads	Drive app downloads and engagement with app promotion ads.
Video	Video ads that show online. Run standalone video ads or insert them in streaming video content.
Product Shopping ads	Shopping ads show users a photo of your product, a title, price, shop name and more details about your product.
Showcase Shopping ads	An image and description that expands when clicked to show several related products and information about the store.
Call-only ads	People can click on these ads and then call the business directly. These ads will only appear on devices that can make phone calls, and any field in these ads can be hidden to fit on smaller screens.
Responsive ads	Responsive ads automatically adjust their size, appearance, and format to fit available ad spaces. They can transform into text or image ads.

Google has two networks where ads can be published, the Display Network and the Search Network.

The Display Network refers to websites and applications, on mobile or desktop, that are partnered with google and google proprietary applications and websites, like Gmail, YouTube or the Google Play Store on Android, when a marketer publishes a google ad using the Display Network the ad is posted in any of these platforms.

On the other hand, the Search Network refers to their search engine, the most popular search engine in the world. Aside from the difference where the ad might be posted when the marketer choses one of these two networks, the ad formats that can be used also change according with each network, Image ads for example can’t be posted on the search network.

Facebook also has their own ad formats that cater to their own platform and business [51], these formats are comprised of Photo ads which are high quality images or illustrations much like the image ad from google, Video ads, Stories ads which are common in applications from the Facebook network like Instagram, WhatsApp and Facebook itself and these are Images or videos that are placed in between the platform users content, Messenger ads that use the

Facebook chat to drive consumers to start conversations with the advertiser's business, Carousel ads lets advertisers showcase up to ten images or videos within a single ad, Slideshow ads are video-like ads made of motion, sound and text, Collection ads let people discover, browse and buy what advertisers offer where people can tap an ad to learn more about a specific product and finally Playable ads offer people an interactive preview before they download an app, these ads help find higher intent users for the advertised app with this try-before-you-buy experience. Facebook formats are detailed in table 2 and the descriptions are from Facebook's website and are targeted to advertisers [51].

Table 2.2 - Facebook mobile ad formats

Format	Description
Photo	Photo ads offer a clean, simple format to feature engaging imagery and copy. Convey who you are and what you do through high-quality images or illustrations.
Video	Tell your story with sight, sound and motion. Video ads come in a range of lengths and styles – from short, feed-based ads that you watch on the go, to longer videos that you watch on the sofa.
Stories	Stories are a customizable, edge-to-edge experience that lets you immerse people in your content. Tap into their passions and inspire them to take action on mobile.
Messenger	Messenger ads help people start conversations with your business. Get personal with current or potential customers and add interactive or automated features.
Carousel	Carousel ads let you showcase up to ten images or videos in a single ad, each with its own link. Highlight different products or tell a brand story that develops across each card.
Slideshow	Slideshow ads are video-like ads made of motion, sound and text. These lightweight clips help you tell your story beautifully across devices and connection speeds.
Collection	Collection ads let people discover, browse and buy what you offer. People can tap an ad to learn more about a specific product, all within a fast-loading experience.
Playable	Playable ads offer people an interactive preview before they download an app. Find higher intent users for your app with this try-before-you-buy experience.

2.5.Relationship between formats and advertising effectiveness

Previous research has shown that different Mobile advertising Formats impact attitude towards advertising and advertising effectiveness in different ways [5]. Although there is no previous work evaluating the effectiveness of the exact same online mobile ad formats this thesis proposes, there is some research done on the effectiveness of several different formats and ad platforms, some are studies on a specific demographic group and others are just general studies, there is no study on different demographic groups and how they can behave differently towards distinct mobile advertising formats.

The search conducted was done using Google Scholar and Spring Link, with the following search body being used, “Mobile Advertising Formats Effectiveness”, “Mobile Advertising Formats”, “Mobile Advertising Effectiveness”, “Display Mobile Advertising”, “Targeted Mobile Advertising Formats” and “Online Mobile Advertising Formats Effectiveness”. More information was found through the bibliography of discovered relevant work.

Most of the results are either only focused on SMS and MMS [54] [41], usually older studies from when online mobile advertising wasn’t mainstream, or a mix of SMS and MMS advertising with online mobile advertising [3], the ones focused only on SMS and MMS won't be taken into consideration.

According to [55] Video advertising is not as effective as Display advertising that includes Image Ads/Banner, video drives engagement but doesn’t drive sales the same way images drive.

In line with [55] results, [56] also concluded that motion pictures have a strong ability to shape consumers initial attitudes but over exposure time consumer attitudes towards it changed negatively while the formats of text and still pictures increased drastically, the study also pointed out that “text is more effective for providing information and promoting learning than are motion pictures or still pictures”.

Works in [55] and [56] both concluded that still images/banner and text are more effective than motion pictures and other rich media, but this conclusion has been also mystified by several studies that put interactive advertising and rich media in front of banners [5]. Works in [3] and [4] even found that Millennials view banners negatively and this search is much more personalized and focused on one demographic group than the ones that support banners, and since consumer demographic variables have been found to be key on how consumers perceive mobile advertising [37] these finding might be different because of that variable.

The work in [5] concluded that the rich media mobile application advertising format is more effective than banner advertising, rich media refers to the use of animation, sound, video and other elements that encourage viewers to interact and engage with the content in the mobile advertising experience.

In a research about the generation Z’s attitude towards mobile ads [57] pointed out that ads should be more interactive, and the user should have control over the ad, like the ability to skip a video or to click the ad to perform an action, in order to achieve more effectiveness and avoid irritation from the young consumers. According to [58] the Generation Z is defined has people born between 1997 and 2012 now having between 7 years and 22 years of age.

Also, about a young group of consumers, [3] found that Millennials, although having a general negative attitude towards mobile advertising in general, had the most positive attitude

towards mobile advertising delivered through Apps and on the contrary the most negative attitudes towards banner ads. In a study about SMS based advertising [44] also advises a transition to mobile applications from companies in order to improve consumers´ attitude toward mobile advertising and its effectiveness.

Chapter 3 – Research Framework

3.1. Research hypotheses

In this dissertation we are setting out four distinct research hypotheses. It starts with testing if Millennials do have negative attitudes towards the ad format Banner/Image ads as work in [3] concludes. Recall that Millennials are a generation that was born between 1981 and 1996, so having now between 23 years and 38 years of age [58]. It was also concluded in [3] that Millennials prefer receiving ads on mobile applications and millennial's favourite delivery platform of the three publishing platforms, Search Engine, Mobile Websites and Mobile Applications, will also then be tested being the second hypothesis. The third hypothesis relates to the study in [57], which states consumers from generation Z prefer interactive ads. The fourth and final hypothesis also relates to interactivity, where in [5] it is concluded that the rich media in mobile applications is more effective than banner advertising.

To sum up, the research hypotheses we set out are as follows:

H1. Millennials have a better attitude towards advertising being delivered through mobile apps.

H2. Image/Banner ads are less effective on Millennials.

H3. Generation Z's prefer interactive formats such as interactive mobile video and showcase shopping ads

H4. Rich media mobile app advertising format is more effective than banner advertising.

The first three hypotheses were chosen because the two younger generations, generation Z and Millennials are the most worth while studying, since these are the generations that are more in contact with mobile advertising, as exposed in the previous chapter. The fourth hypothesis was chosen to test if interactivity is in fact an important construct on the effectiveness framework in relation to all demographics.

Besides dealing with these hypotheses, this research will try to find other demographic relations with mobile advertising formats and platforms, by using statistical and clustering techniques that can find patterns within data.

3.2. Proposed mobile advertising formats taxonomy

3.2.1 Introduction

During the research on mobile advertising formats we found that the general understanding on formats by the different organizations and authors is not standardized. Indeed, Google and Facebook, the biggest advertising companies in the western world, have their own formats [50]

[51] and international associations that create guidelines like the MMA also have their own but different formats [48].

Academic research is also not cohesive in terms of what mobile ad formats are to be considered. The work in [3] groups MMS, SMS, Banner and Application ads and calls them media types, which refers "to the mode of delivery". This representation seems misaligned since MMA considers Banner ads a format and not a mode of delivery; a banner can even be delivered within an MMS, a mobile application and a mobile web browser according with MMA. In [52] a research about the relation between mobile ad formats and effectiveness for MMS and SMS categorizes ad formats as Text, Image and Films. Also, work in [5] mentions MMAs mobile ad format categorization and uses Dynamic Banners ads and Rich media ads on a study about the effectiveness of interactive modes.

Hence, in order to achieve the best results in this research, we need to clarify the concept and categorization of mobile ad formats. To do so, a taxonomy of mobile ad formats has to be created.

3.2.2 Rationale

The taxonomy we envisage will make use of the mobile ad formats categorized by the two biggest mobile advertising companies, Google and Facebook, and the mobile ad formats described by Mobile Marketing Association. The end goal is to finish with a clear classification of mobile ad formats that doesn't compromise any of the ads proposed or used by these organizations.

The text ad described by Google can be equated to the Text tagline by the MMA. Both descriptions refer to an ad that uses text only. MMA also refers that the text tagline can be used with the banner ad as a supplemental feature that should be added when possible and the Facebook Photo ads do exactly that. Notice that there is almost always a text tagline underneath a Facebook Photo ad [51]. Although Facebook doesn't have text only ads, this research will consider the text ad since it's the most basic and widespread type of ad and it is especially used in the Google Search network. The text ad can be described as a text only format and can be displayed in Mobile Applications, Mobile Websites and in the Google Search Engine.

The banner ad described by MMA can be compared to the Image ad from Google and the Photo ad from Facebook. The banner ad is defined by MMA as a still image with colour that can be used in mass market campaigns where the final objective is good user experience across all mobile devices. These ads can appear on a Mobile Website and Mobile Application. On the other hand, Google describes its Image ad as a static or interactive image such as a gif or flash

content. These image ads by Google can also appear in Mobile Websites and Mobile Applications. Facebook keeps its description within the same line of thought, high quality images or illustrations. This dissertation proposes a Banner ad as a format that can be displayed either in Mobile Applications or Mobile Websites, with the description being "A Static High-Quality image with colour or black and white.". The description from Google includes flash content, but we will consider it as rich media, although flash content is not as widely used as before, with HTML5 being the new standard, particularly within mobile web.

The Rich Media Mobile ad format from MMA can also incorporate other ad formats like the Playable ad format from Facebook, which is rich media by itself. Rich Media allows mobile applications and browsers to deliver experiences that go past displaying text or video. There are several technologies, which enable rich media such as AJAX, HTML5 and Flash [53]. Google, although not considering it an ad format, made a page explaining Rich Media [53] and stated that HTML5 ads can appear on mobile devices [50]. Rich media ads can appear on Mobile Applications and in Mobile Websites according to MMA. We will follow the proposed MMA's definition, which is: "Rich media Mobile is a supplemental ad unit defined by the two-stage principle of display and activation. Display is the way a rich media mobile ad resides in a usual ad space of a host property (application or website) and calls for action in form of a banner or similar ad unit. Only when the user interacts with the displayed banner by clicking or swiping it, do the RMMA features become activated, showcasing their characteristic "rich" behaviour.".

The video ad is also common across Google, Facebook and MMA classifications of ad formats, but MMA is a lot more detailed and in-depth with the classifications of video ads. MMA breaks them into lineal ads, non-lineal ads and interactive mobile videos, lineal ads refer to when an ad takes over the full mobile display screen and replace the streamed or downloaded video content with a video or static image ad for a given period of time, non-lineal ads share the mobile display with the content being streamed or downloaded and finally interactive mobile videos allow interaction by clicking, zooming and browsing with the consumer receiving the ad. The specifications by MMA go even deeper breaking Lineal ads into different categories according with break timing, if the ad is run pre, mid or post roll of the content being streamed.

Since Google and Facebook don't have this amount of specification in their definitions and it's impossible to get every way of presenting a video format categorized, this dissertation will consider the video ad definition by Google since it includes standalone video ads and video ads that run on streaming content and doesn't take into account timing of insertion or length leaving

that option open, this definition is also close to the one by Facebook, these ads can be displayed on Mobile Applications and on Mobile Websites according with Google and Facebook which also operates within Mobile Applications and Websites.

App promotion ad format described by Google can be equated to the Sponsored Mobile Application ad format described by MMA, both formats refer to promoting the download of an Application in various places across a Mobile Application or a Mobile Website. Facebook doesn't mention this format in their categorization of ad formats, but an advertiser can use any of the Facebook formats available to promote downloads and traffic towards their Mobile Application. The difference is that Google, apart from having a specific format with a download button and specialized style for that task, has an app store and is able to capitalize on it to drive more downloads. App promotion ads will be considered, and the Google description will be used since the description from MMA narrows this type of ad to only be displayable within Mobile Applications when in Google's reality it can be displayed in Mobile Websites as well as Mobile Applications and their Search Engine.

The integrated ads described by MMA can be compared with the responsive ads outlined by Google, both descriptions point to flexibility and integration with the app, Google points out that these types of ads can turn into an image ad or a text ad according with each Mobile Website or Mobile Application, basically the ad that the advertiser launches into to the Google Network is going to adapt considering each Website. This text won't be considered since the format can't be significantly distinguishable for the end consumer receiving it, at the end of the process it's still an image ad or a text ad and since the objective is to evaluate the consumers attitude towards the ad format and not the ad technology being used this thesis won't integrate it.

MMA is the only institution considering a Mobile Application as an ad format, pointing out Nestles recipe app or Duracell running game as form of advertising, since our definition of online mobile advertising considers mobile applications as a medium of delivery and not an ad in of itself this format won't be considered.

The Mobile Application Interstitial Ad proposed by MMA is an ad format that's full screen and covers the entire user interface of the host application. These ads are usually placed in the natural flow of use of the application for example when the app is exited or at the launch of the app. This ad format is different from the banner ad format since the banner doesn't take up the user interface being part of the application's user interface instead, banners usually appear in the main menu page or the content pages along with the application's original user interface. Google, although not referencing this ad format on their list, also refers to this ad in one of their webpages that support ads on android and the description can be equated to MMA's.

Facebook also has an add that can be equated to the Interstitial ad described by MMA, the stories ad by Facebook is a full screen vertical ad that can run either video or image and is integrated with the user interface flow of the application just like the Interstitial ad, for this reason this thesis will acknowledge the Mobile Application Interstitial Ad format since its referenced by MMA, Google and Facebook in one capacity or another and is also significantly different from banner ads.

Showcase Shopping ads detailed by Google can be compared with Facebook's own Collection ad format, both showcase multiple products from an advertiser's store and do it using several images and descriptions, after the consumer clicks these ads they are relayed to a page where they can make the purchase. The difference from Google's Product Shopping ad format to the Showcase Shopping ad format is that the latter shows several items of one store while the Product Shopping ad only displays one single product. Showcase Shopping ads and Product ads will both be considered.

Call only ads only described and proposed by Google will be taken into account since these are widely used in the Google Search network when consumers search for restaurants or other open to public establishments This format of ad only serves to display an establishments phone number that when clicked will be redirected the number to the phone's dialler, and these ads only display on Mobile devices capable of making phone calls.

The final ad formats considered by this dissertation are the messenger ad format and the carousel ad format. These ad formats were only proposed by Facebook since the messenger ad runs ads on their proprietary messaging system and the carousel is also exclusive to the feed of their social networks.

The messenger ad format refers to ads run on their messenger app which is widely used, these formats will appear in consumers chats tab in their Messenger app, when the ad is tapped, the consumer will enter a detailed view within Messenger with a call-to-action that will take them to the destination that the advertisers choose during the ads creation.

Finally, the carrousel ad format by Facebook puts up to 10 images or videos within one single ad where consumers can slide between each card and the advertiser can develop a story along the way, each card can have its own different landing page after its clicked.

3.2.3 Taxonomy

Table 3 presents the formats taxonomy we propose. It is organized by the name of the ad format, its description and on what platforms the ad formats can be displayed. The platforms are Mobile Websites, Mobile Applications and Google's Search Engine. Of course, this ad

format categorization doesn't encompass every mobile ad format and every way and shape they can take. Indeed, it is impossible to take every ad into account. For instance, an image can have uncountable sizes and colour combinations and different ad formats are appearing every year. But this proposed taxonomy is an attempt at representing most of the ad formats in a broader way, and taking the ad formats from the two biggest mobile ad companies in the world, Google and Facebook, alongside an international mobile ad association, the Mobile Marketing Association, that creates guidelines and advises companies on Mobile advertising.

Table 3.1 - Proposed mobile ad formats

Format	Description	Publishing Platform
Text ad	Words only.	Mobile Websites Mobile Applications Search Engine
Banner ad	A Static High-Quality image with color or black and white that is often accompanied with text.	Mobile Websites Mobile Applications
Video ad	Video ads that show online. Run standalone video ads or insert them in streaming video content.	Mobile Websites Mobile Applications
Rich Media ad	Rich media Mobile is a supplemental ad unit defined by the two-stage principle of display and activation. Display is the way a rich media mobile ad resides in a usual ad space of a host property (application or website) and calls for action in form of a banner or similar ad unit. Only when the user interacts with the displayed banner by clicking or swiping it, do the RMMA features become activated, showcasing their characteristic "rich" behavior.	Mobile Websites Mobile Applications
App promotion ad	Mobile Ad that showcases, with the use of text, a downloadable application with a link to the app store or a deep link directly to the app.	Mobile Websites Mobile Applications Search Engine
Interstitial Ad	Full-screen advertisement, which may be placed as a "bumper" screen for the launch and exit of the application, or as a splash or jump page within the application. It may be used as the landing page from an earlier ad banner or may be a stand-alone Interstitial. This Interstitial may also be active or static.	Mobile Applications

Showcase Shopping ads	An image and description that expands when clicked to show several related products and information about the store.	Mobile Applications Search Engine
Product Shopping ads	Shopping ads show users a photo of your product, a title, price, store name, and more details about your product.	Search Engine
Call only ads	People can click on these ads and then call the business directly. These ads will only appear on devices that can make phone calls, and any field in these ads can be hidden to fit on smaller screens.	Search Engine
Messenger ad	People will see these ads in the Chats tab in their Messenger app. When they tap on an ad, they'll be sent to a detailed view within Messenger with a call-to-action that will take them to the destination you chose during ads creation – whether that's your site, app or a conversation with your business on Messenger	Mobile Applications
Carrousel ad	Carousel ads showcase up to ten images or videos in a single ad, each with its own link. Highlight different products or tell a brand story that develops across each card.	Mobile Applications

3.3. Research Design

3.3.1 Introduction

Research design is a work plan or proposal to conduct research that makes sure that the evidence acquired enable us to answer the initial research question as unambiguously as possible. It involves the junction of philosophical worldviews, inquiry strategy and specific research methods, so we are dealing with a series of actions and decisions ranging from broad assumptions to more detailed methods of analysis and data collection [59]. Figure 3.1 depicts such framework.

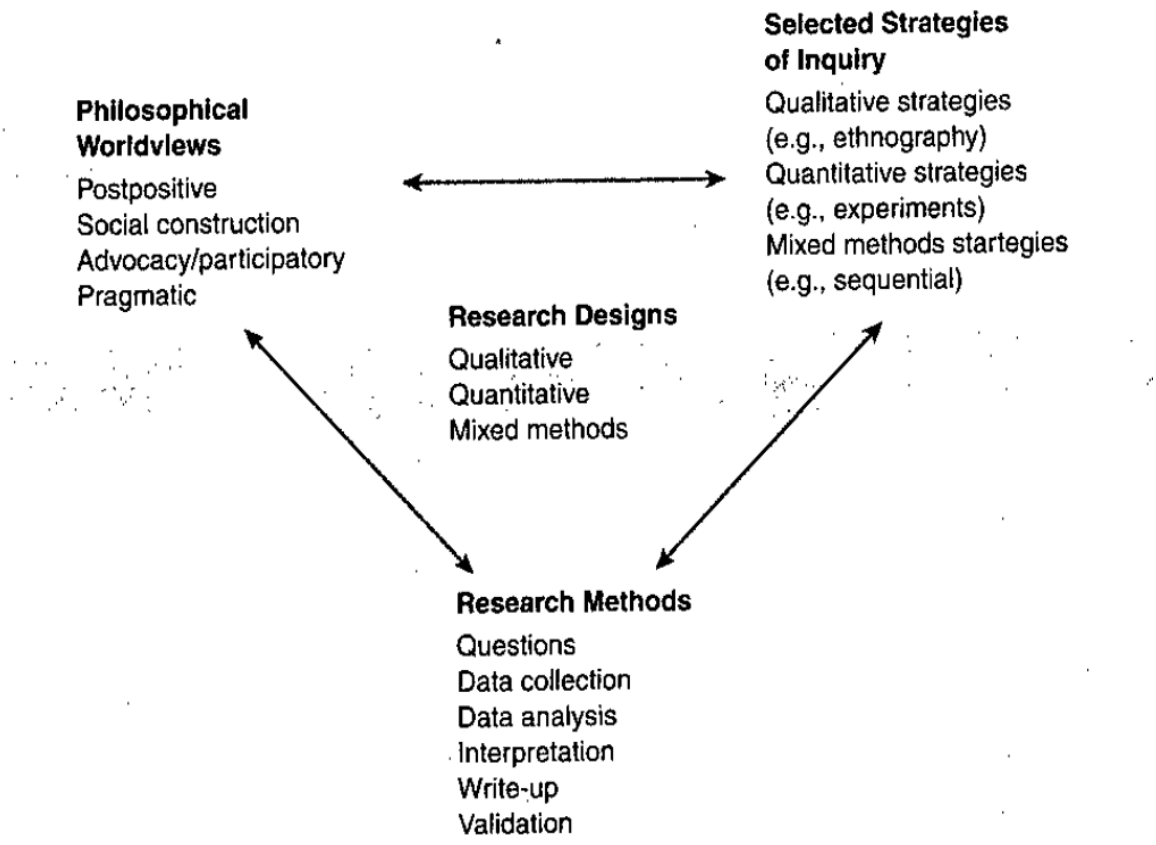

Figure 3.1 - A framework for Design - The Interconnection of Worldviews, Strategies of Inquiry, and Research Methods [59]

3.3.2 Quantitative, qualitative and mixed methods research designs

According to [59] there are three types of design: quantitative, qualitative and mixed methods. Quantitative and qualitative designs can be considered as polar opposites. In general, quantitative design is related to numbers and qualitative to words but the best way to differentiate between them is through the philosophical presumption that researchers usually follow in the studies, the types of strategies and the methods employed to bring closure to these strategies.

This research will implement quantitative design, by inspecting the relationship between variables, which can be measured and can be analyzed through statistical procedures. This type of design fits with this research since there is a need to compare variables like informativeness, entertainment, irritation, credibility, and interactivity, with the consumers personal information like their demographic information and other useful details, for example which type of phone OS consumers use.

Also, in quantitative design researchers usually have deductive theories, which means that the research will be built upon the grounds of previous analysis done on the subject, instead of inductive where the researcher produces new theory from observations. This research will use previous research has a basis to work on and it will also verify hypothesis of previous work making it deductive, but although it is deductive during the duration of the statistical analysis it is also expected for some new connections between variables to be encountered making this part of the research inductive.

3.3.3 Philosophical worldviews

The next step is exposing the philosophical worldview proposed for the study and how this worldview shapes the research. By clarifying a worldview, it helps justifying the choice of quantitative design in this dissertation. According to [59] there are four different categories of philosophical worldview, Post-positivism, Constructivism, Advocacy/Participatory and Pragmatism.

This research will assume a Postpositivist standpoint, which holds a deterministic philosophy meaning the analysis of the causes that influence the outcomes and its identification is the answer to the research problem. In our case there is the presumption that consumers will answer differently in accordance with their demographic data and other relevant data of each consumer.

Under this "worldview" knowledge is shaped by data, evidence and rational considerations, just like this research intends to do by collecting information and analyzing it, in order to accept or reject the proposed hypotheses and find new insights on consumer attitudes towards online mobile advertising [59].

3.3.4 Survey design and research methods

The next choice is regarding strategies of inquiry within the quantitative design we have elected. This study will follow the survey research [59], mainly because it is practical for the analysis of attitudes, opinions and trends within a sample of population and that fits with the objective of this research, which is to analyze the consumers of Europe and North America for their attitudes towards mobile online advertising formats. The sample is about consumers from North American and European countries and the questionnaire is about their attitudes towards online mobile advertising. So, a survey research is an appropriate and effective way to pinpoint different characteristics of a large population from a small set of individuals.

The survey can also be either cross-sectional which is where the data is all collected at one point in time and variables are observed without being affected meaning that the survey is answered by many different subjects at once while in longitudinal surveys the information is collected overtime and the survey collects data about the same participants overtime usually focusing on sample groups that are linked through common attributes [59].

Staying on the same note of the research problem, the survey of this research will be following a cross-sectional design since it allows the researcher to collect data from a sizeable pool of consumers and analyze differences between groups of participants, splitting them by demographic details. Other advantages of cross-sectional design in surveys is the fact that they are usually cheaper to perform and take less time to achieve since it only needs to be collected at one point in time [59].

As far as variables of questioning in the survey are concerned, they will be Informativeness, Entertainment, Irritation, Credibility, Interactivity. These were the feelings indicated during the literature review we have done that impact the most on consumers overall attitude towards mobile advertising. Also, on top of these variables that will be put forward as a possible answer to how a consumer feels about each mobile online advertising format brought together by the taxonomy, there will be questions about each consumers demographics and other relevant data, such as age, gender, education, country and smart phone operating system.

The survey is comprised of 20 questions. The first five ask about the consumers demographic or other relevant personal data, and the remaining15 questions are inquiring about how those consumers feel regarding each respective format detailed during the mobile format taxonomy. Moreover, each question is also accompanied with images for reference, since the participants might not be able to identify an online mobile advertising format by its name. The only scale we use in the questionnaire is positive and negative, with Informativeness, Entertainment, Credibility, Interactivity meaning positive attitude and Irritation meaning negative attitude overall towards the ad. The survey is available in Annex A.

The data collection process of the survey will be done using a web-based survey platform called SurveyMonkey. It is an online tool that let users to create questionnaires and then spread it online through a link to the questionnaire webpage or by email which were the methods used to propagate the survey throughout the intended target group which where people from North America and Europe from all demographic classifications meaning all ages, all education levels and both genders so during the analysis there is enough data about each group to reach a conclusion.

Web based surveys have the advantage of accessing unique populations that otherwise wouldn't be possible. In our case, the research is being developed in Portugal and via other means the survey couldn't be spread. The survey was spread online with appropriate target population with the help of friends, co-workers and family, who would share the web-based questionnaire. Other advantages of web based surveys is the time it saves researchers as well as cost. According with [60] online surveys allow a researcher to get to hundreds of participants in a short amount of time despite being geographically separated by a long distance. It also allows researchers to work on another tasks while the survey is being answered and spread, as well as saving costs due to its online nature, as opposed to mail or face-to-face interviews for example.

3.3.5 Population and sampling

Sampling is one of the most important parts of a survey. According with [61] it involves taking a subset from an entire population or sampling frame, and in turn to be used to make deductions about that population or extrapolate something in connection to an existing theory. A sampling frame is a list of the cases from which the sample will be extrapolated and must be naturally illustrative of the entire population.

The first stage of the sampling process is intended to define the target population [61]. Then, the following step is to choose a sampling technique. There are two prevailing types of sampling techniques, the probability sampling also known as random sampling techniques, and the non-probability sampling also known as non-random sampling techniques.

Probability sampling technique involves a random sample where each individual has an equal probability of being selected [61] [60]. This can be achieved by creating a sample frame of the population and then randomly picking people out of the sample frame. In this way the equal probability is achieved. This type of sampling technique is hard to achieve in the context of this research as to having a complete frame of all the consumers of North America and Europe is expensive, time consuming and not feasible for the scope of study. Therefore, we will not follow this sampling method.

The non-probability sampling technique is usually related to focussing on smaller samples to study real life occurrences. There are several types of non-probability sampling methods, quota sampling, snowball sampling, convenience sampling and purposive or judgmental sampling to name a few [61].

This research will follow the convenience sampling technique because it fits in the scope and overall reach and budget we have. The technique consists of selecting consumers

considering their availability, accessibility and willingness to take part of. According with [61] this type of sampling is widely used by many research students since it helps them overcome limitations with research, it is inexpensive and an easy alternative when comparing to other techniques. Actually, there is always the possibility of using friends, friends of friends, co-workers and family as part of the sample. On that basis, we will be using that method instead of targeting unknown individuals, which would be much harder and time consuming. However, there are some disadvantages to using this convenience sampling method. For example, the case of selection bias since the sample will be related in one way or another to the researchers and those who volunteer may be different from those who choose not to take part of; or the sample not being entirely representative of the target population intended for the research for the same reasons.

3.3.6 Data analysis

The survey data will be collected from the SurveyMonkey tool after the participants finish to responding it and stored in Excel format file. Then the data will be processed and analyzed using the software program SPSS, as well using Python programs in the Jupyter Notebook platform.

Notice that SurveyMonkey has internal tools that help create graphics with basic organized information about the data retrieved from the answers. This kind of tools will be used to perform some initial reporting about the data, for example, to know about how many users are male and female and so on.

SPSS is an IBM software program that offers advanced statistical analysis along with a large library of machine learning algorithms and integration data and deployment applications. The SPSS software was choose for this research because of the ease of use and accessibility of the application, so leading to improvement of efficiency with tests that are already built in [62].

In order to validate the internal consistency reliability of the survey answers, we will rely on Cronbach alpha methodology. It is a widely used measure of reliability in the social and organizational sciences [63] and the results are conveyed as a number between 0 and 1. Recall that internal consistency recounts the dimension to which every item in a test measure the same concept or construct, hence measuring homogeneity and one-dimensionality within a sample of test items [64].

Then, after the reliability testing and an initial data summary is laid out, we will start creating the costumer profiles using personal traits and inclinations, filtered by their preferences in the formats of ads. To do so, we will apply clustering analysis

techniques to the data acquired on the survey. One of the clustering techniques will be K-Means, which will be implemented in the Jupyter Notebook platform and by taken advantage of available Python libraries, in particular machine-learning libraries.

The Jupyter Notebook environment also allows users to run code and share the findings in a web browser, so explaining it via text and data visualization. So, there is more than simple statistical modeling features.

Finally, the customer profiles we aim to create will be based on their demographic information. In this way, we are able to the search patterns that relate certain groups of people with a preference in formats of mobile.

Chapter 4 – Analysis and discussion

4.1. Reliability test and data summary

We have collected 584 responses in total from the survey. As a note, it might not be as many responses as we wanted, but still is above average if comparing to similar surveys and topic in academic context. For instance, the work in [3] just presented 136 responses for their research and data analysis. The survey data collection took place between August and September of 2019.

We notice that in questions related to how users feel about mobile advertisements in general and for each online mobile advertising format, the participants were given the freedom to choose multiple constructs on how they feel, either being *informativeness*, *entertainment*, *irritation*, *credibility*, and *interactivity*. Therefore, the graphs on these specific questions won't add up to 100% of the population and simply represent what percentage of the population picked up that feeling.

The initial reliability test performed with Cronbach Alpha showed positive results. Recall that the range is from 0 to 1, where 0 means poor correlation between items and low reliability and 1 means more inter-relatedness and better reliability. Table 4.1 shows the reliability score we got on the surveys data. According to [64], a recommendable value should be ranging between 0.70 to 0.95 so the value of 0,822 we get for Cronbach's Alpha is ideal for this research.

Table 4.1 - Reliability Statistics Cronbach alpha

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,822	0,815	14

With strong Cronbach Alpha scores, the concepts and constructs of the questionnaire are safeguarded, and the analysis can proceed with more security. The next stage is to do some descriptive analysis in order to better understand the sample data.

Starting with the age of the participants in the survey, the results are satisfactory since populations are usually split by gender evenly. The survey follows the same trend with 56.34% female respondents and 43.66% of the remaining participants being male as can be seen in Figure 4.1.

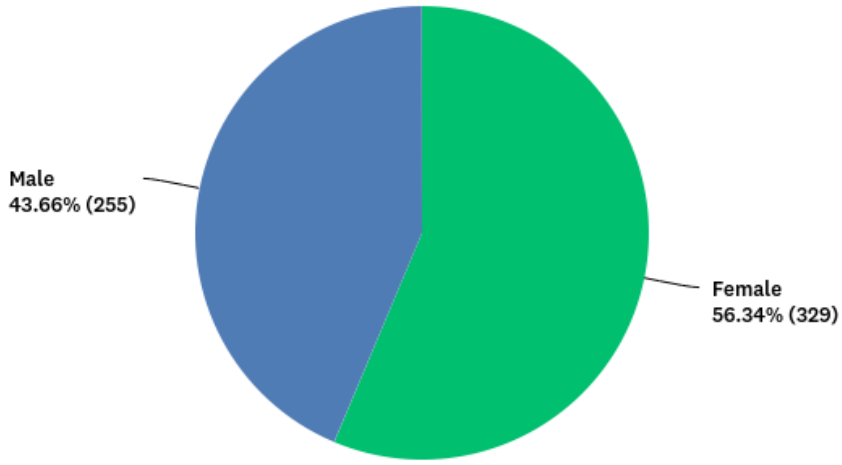

Figure 4.1 - Gender Statistics

Age is also an important demographic measure for the research and although the survey didn't reach the expected diversity of age groups, it is enough to do some analysis and to make some inferences about it. The age statistics are presented in Figure 4.2. The largest age group amongst the participants is being from 25 to 34 and representing 35.79%, followed by 20.03% between the ages of 35 and 44, 16.27% from 18 to 24, 15.75% and 8.05% representing the age groups 45 to 54 years old and 55 to 64 years old respectively. The disappointment comes from the age group bellow 18 years old which is a low value of only 1.37% of the respondents.

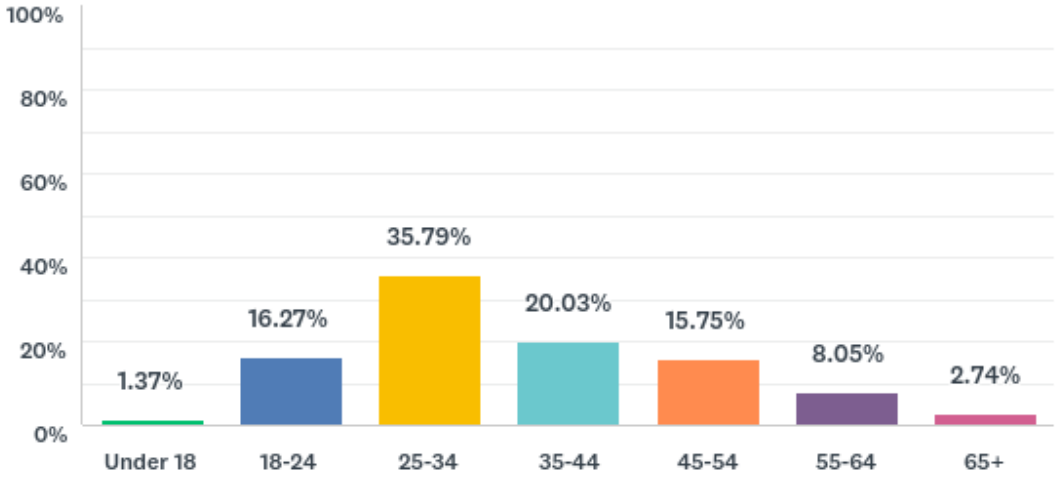

Figure 4.2 - Age groups of the participants

Respondents country of residency is also an important factor to take into account since the aim of the study is to see how residents of North American and European countries react to different formats. The participants in the questionnaire weren't as diverse as expected due to difficulties in spreading the survey over both continents.

The respondents turned out to be mostly from the United States of America as seen in Figure 4.3, with a representation of a little bit over 80% of the participants, followed by Portugal and United Kingdom, with both constituting about 9% and the rest being residual respondents from Poland, Germany, Sweden, Norway and Spain.

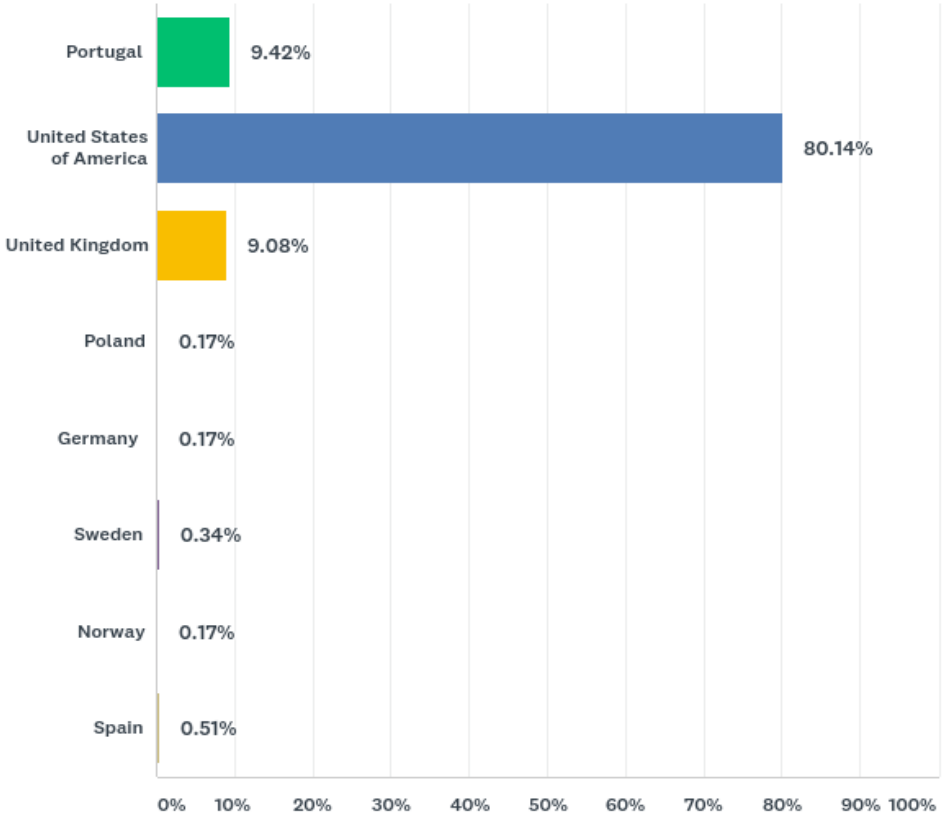

Figure 4.3 - Summary of the Country of residence of the participants

Following the question on the country of residency, the participants were also asked about their level of education. The results are somewhat expected after seeing how the age groups are spread out.

The sample displays a large number of respondents that have finished graduating from college at 31.85% and an extra 18.84% that have finished graduate school; about 28% of respondents are currently enrolled in college from the first up to the third year and 5.65% currently enrolled in graduate school. Furthermore, 13.01% of the respondents graduated from high school and the rest residual percentage goes to educations levels below high school. This was expected since from the participants from age groups that are bellow 18 years old are very few.

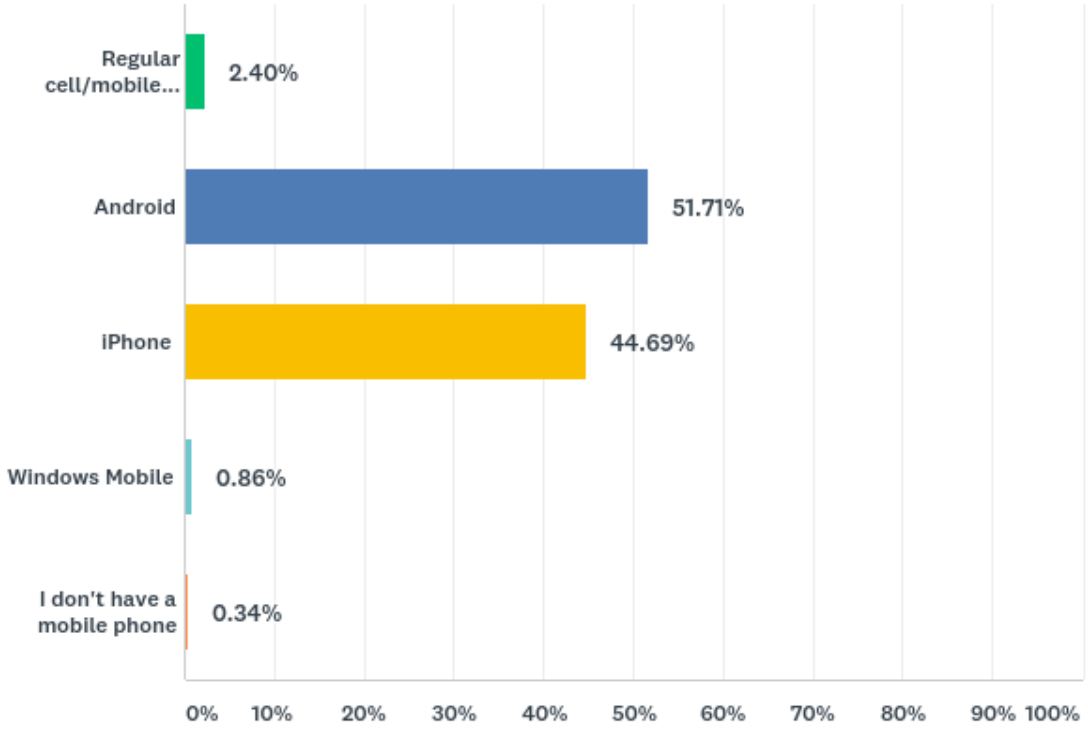

Figure 4.4 - Statistics on what type of mobile phone users currently use

Another important piece of information that was interesting for the research was what type of mobile phone respondents use, as this information might help us to find if the type of phone respondents use affects their experience. This data can be seen in Figure 4.4. The results were expected, with 51.71% of the respondents currently using Android smartphones and 44.69% using iPhones; the remaining 2.4% are using a regular cell phone and less than one percent of respondents have no phone at all or are using a Windows Mobile smartphone.

We also introduced a broader question about which publishing platform do users prefer to receive online mobile advertising formats. The answers were balanced, with 42.98% of the participants reported to prefer receiving advertising on a search engine while doing a search, 29.28% prefer receiving while using mobile applications and, lastly, 27.74% prefer seeing ads while accessing a website on a mobile browser.

4.2.Initial data analysis

Besides the questions on how users feel about each online mobile advertising format, an initial broader question was to ask participants about how they feel in relation to mobile advertising in general. The response was overwhelming, with the vast majority claiming an Irritating feeling about ads – 68.49% of answers – as depicted in Figure 4.5. Hence, we may conclude

that most of the ads are not effective on consumers. On the positive side of the spectrum, some respondents attributed helpfulness and entertainment feeling towards ads, accounting for 32.35% and 14.90% respectively. Interactivity and credibility have lower representation, with 8.22% and 4.45% respectively. On that basis, an extrapolation to be made is that respondents don't feel the ads they come across with are credible or interactive.

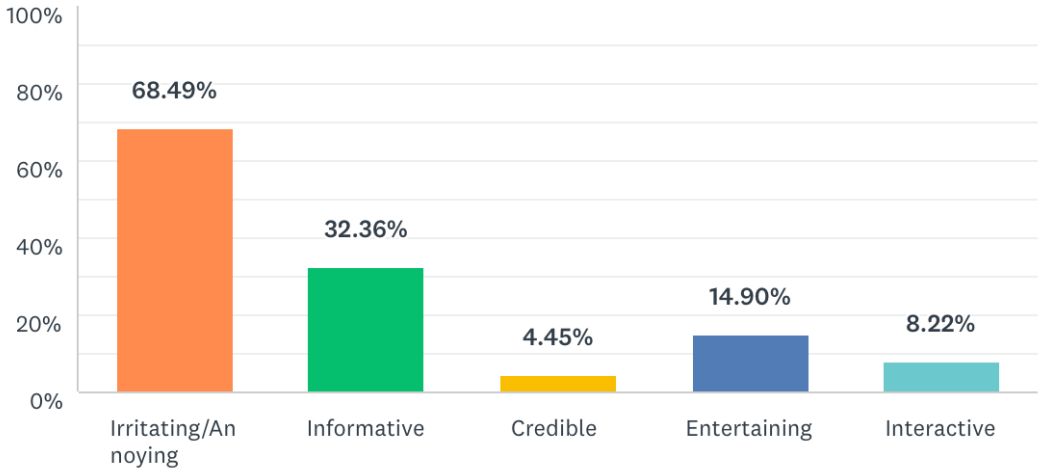

Figure 4.5 - Users feelings about advertising in general

We start now a general analysis of each individual online mobile advertising format. Text ads on search engines was the format with most divisive responses as can be seen in Figure 4.6. Indeed, 51.71% were reporting that they are informative and 9,76% felt that these formats are usually credible and interactive. Entertaining was the least chosen of the positive scale of feelings with 3.60%. And 47.77% thought that this format is irritating and annoying.

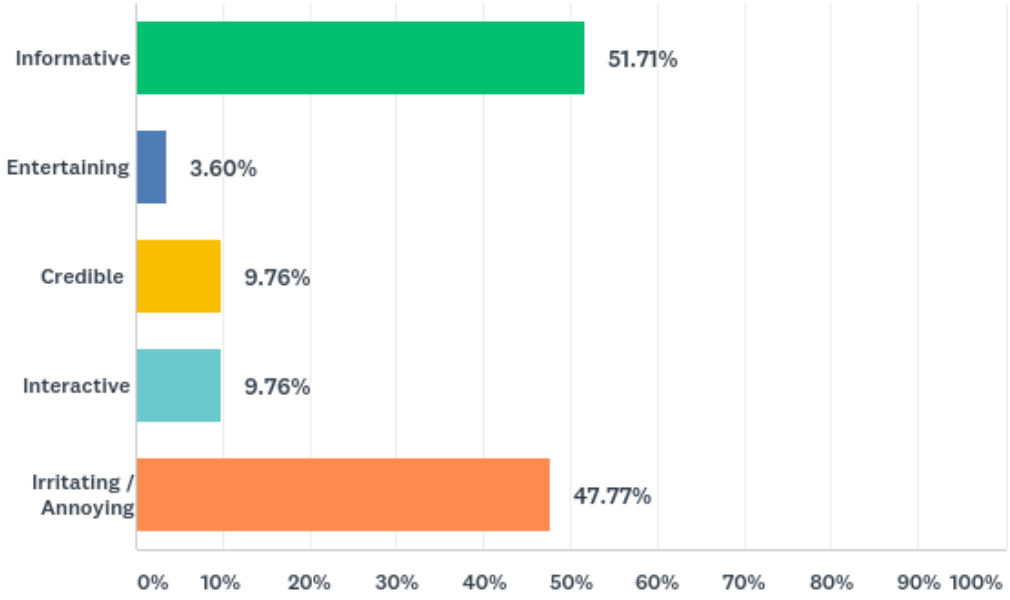

Figure 4.6 - Participants feelings about text ads on search engines

On the other hand, the responses towards the same format of text ads but on a different publishing platform as mobile websites or apps were a lot different, with an overall negative attitude towards it. This is shown in Figure 4.7, where it is indicated that 74.49% of participants have considered it as irritating and annoying.

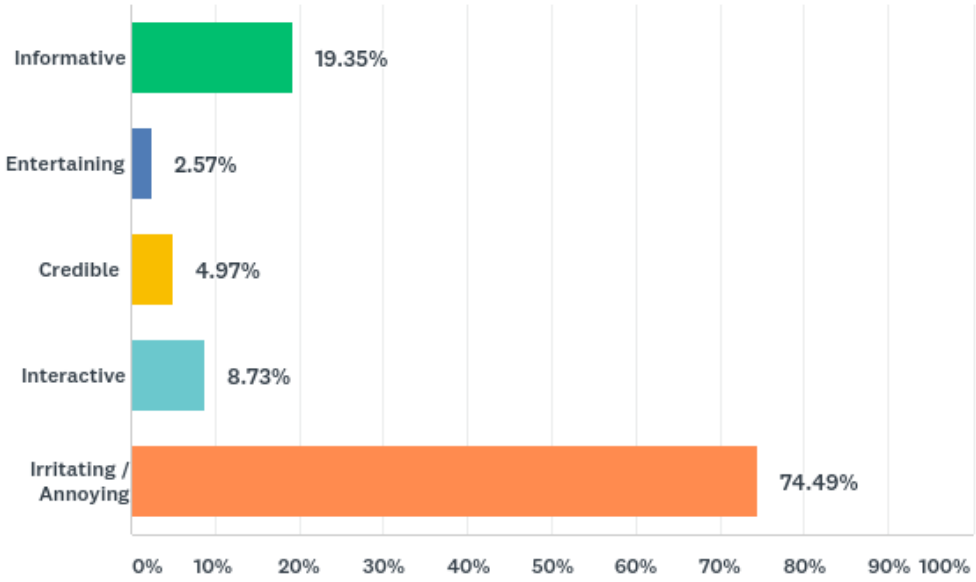

Figure 4.7 - Participants feelings about text ads on mobile websites or apps

Also, messenger ads on mobile applications got a majority of negative attitudes towards it, as depicted in Figure 4.8 with a staggering 77.05% considering it annoying and irritating; only 15.75% felt it as informative, 9.59% as entertaining, 3.94% as credible and 9.59% deem it interactive. This leaves the format of online mobile advertising with a big probability of ineffectiveness for the majority of consumers.

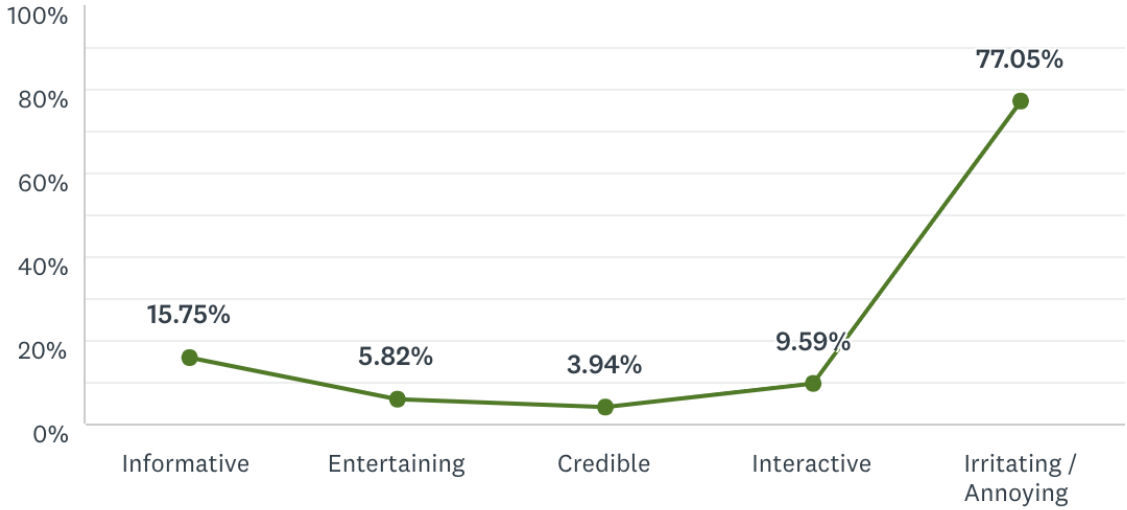

Figure 4.8 - Participants feelings about Messenger ads on Mobile applications

Call only ads also have a majority of participants reporting a negative attitude towards them, with 63.36% finding them irritating and annoying as presented in Figure 4.9. Just around 28% have considered this format as informative, leaving the largest majority on the negative spectrum in relation to call only ad format.

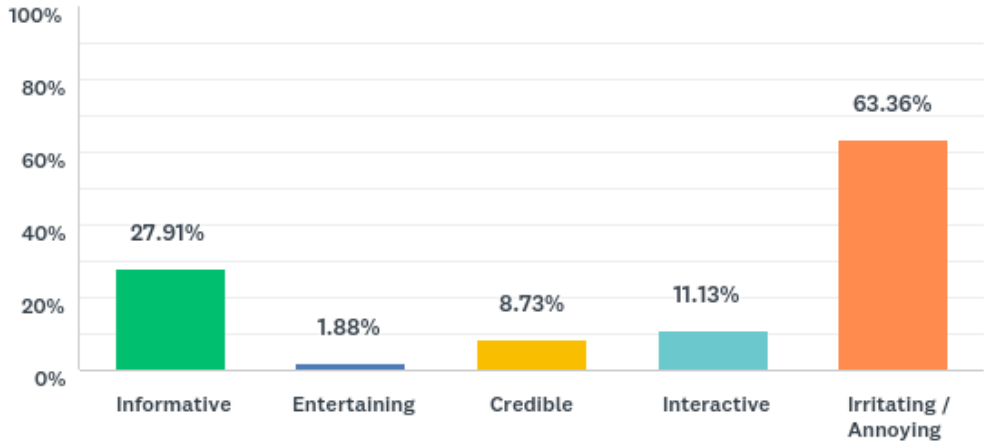

Figure 4.9 - Participants feelings about Call only ads

Results about banners ads on mobile websites or apps can be seen in Figure 4.10. We have 62.50% of respondents considering this format as irritating and annoying; around 20% of the respondents felt the banner ad format is informative and around 17% have considered it as entertaining. Although the latter are positive feelings, the effectiveness is low overall.

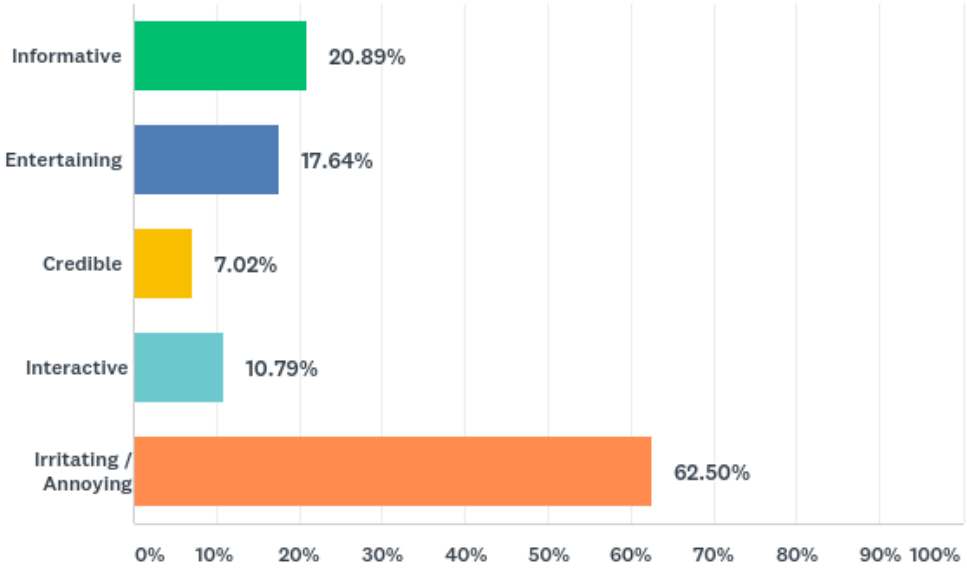

Figure 4.10 - Participants feelings about banner ads on mobile websites or apps

Based on Figure 4.11, it is also clear that video ads on mobile websites or apps face a negative attitude towards them, with 60.27% of respondents to say so. Also, as depicted in

Figure 4.12, interstitial ads on mobile applications are considered as tiresome, with a staggering 71.75% of respondents claiming that is the case.

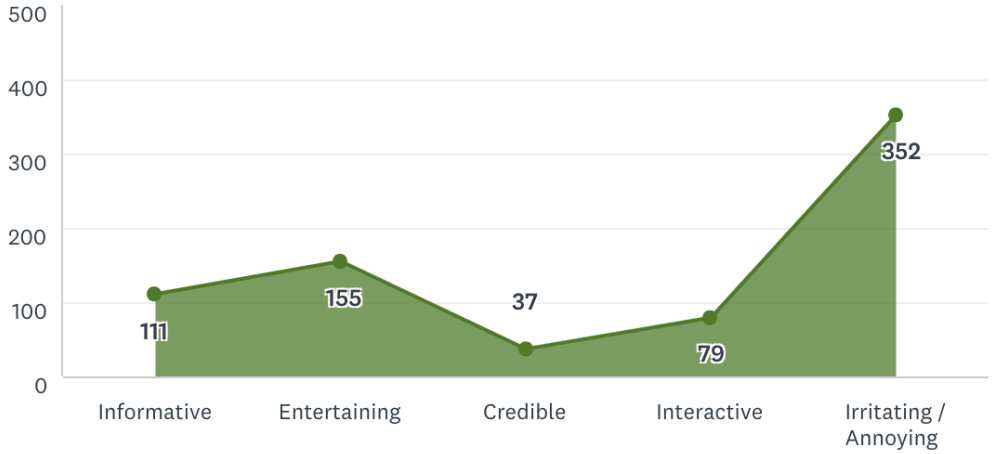

Figure 4.11- Participants feelings about video ads on mobile websites or apps

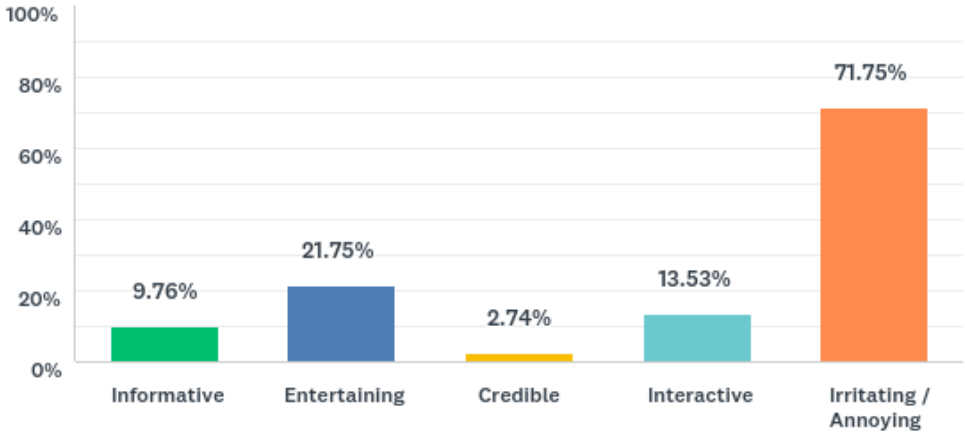

Figure 4.12 - Participants feelings about interstitial ads on mobile apps

Therefore, these ad formats are not recommended for use with most respondents since they won't be seen as effective. Not only that, there is a risk of conveying a bad image of a particular product of the company.

Figures 4.13 and 4.14 show results about other online mobile advertising formats, respectively rich media and app promotion. In both cases, they roughly indicate that half of participants reported them as annoying or irritating. But it is worth pointing that a substantial number of users consider those formats as informative, around 30%. Also, interactivity amounts to 30.14% of respondents for rich media but just 15.07% for app promotion. As for credibility,

they get similar results, around 9.5% of respondents, and, in respect to entertaining, rich media amounts to 15.07% whereas app promotion amounts to 10.79% of respondents.

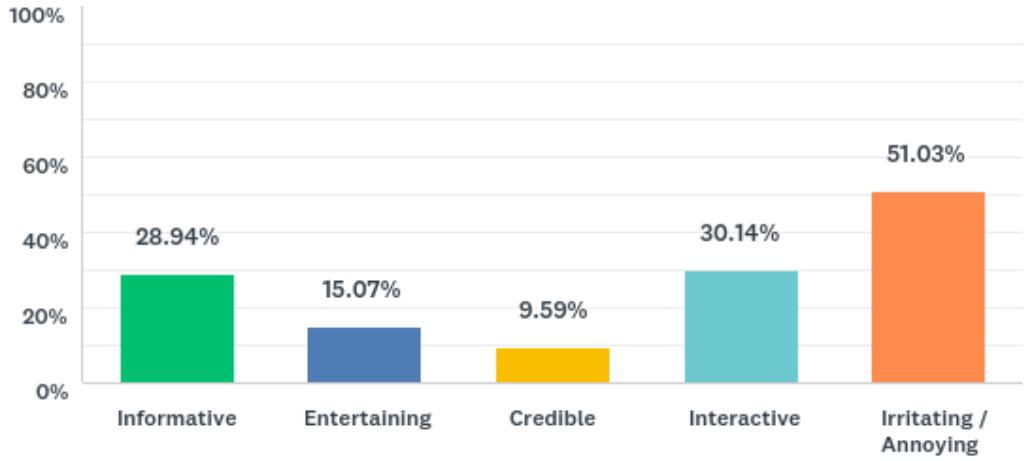

Figure 4.13 - Participants feelings about rich media ads on mobile websites or apps

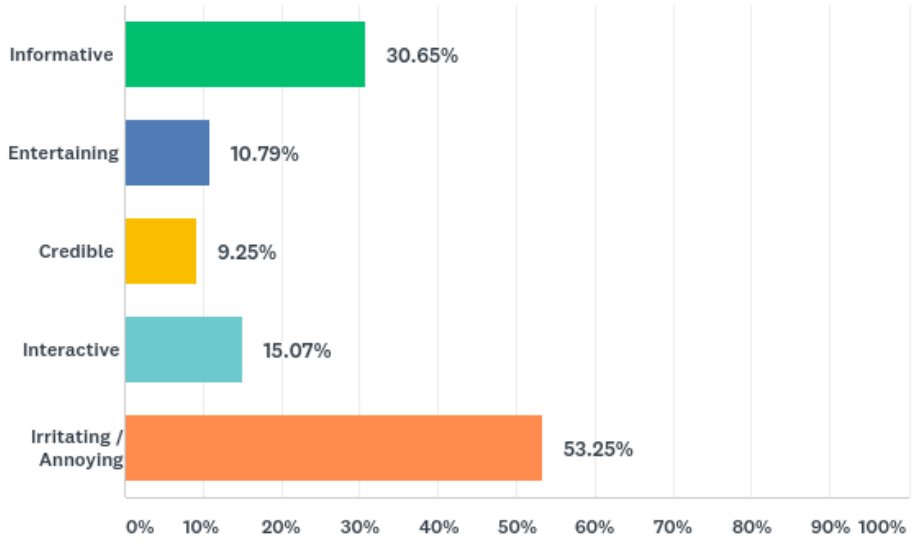

Figure 4.14 - Participants feelings about apps promotion ads on mobile websites or apps

Lastly, we present results in relation to online mobile advertising formats that initially showed some potential amongst the respondents. We start with product shopping ads and showcase shopping ads, as depicted in Figure 4.15 and 4.16 respectively. Both formats have something in common, which is the publishing platform search engine.

Product shopping ads were revealed to be informative for 67.81% of the participants in the survey, with only 24.49% considering them as irritating and annoying. Furthermore, around

18% deemed them as credible, around 16% as interactive and just about 8% of respondents thought they were entertaining.

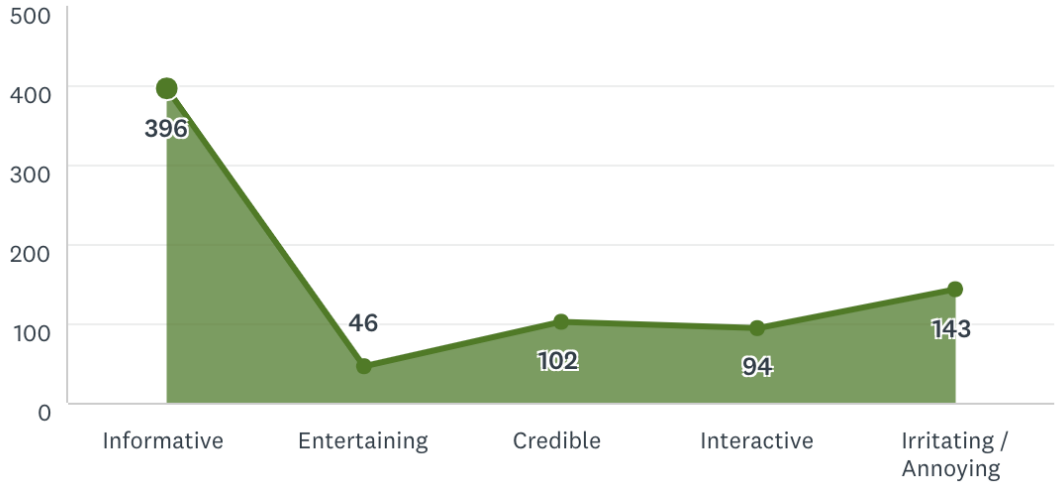

Figure 4.15 - Participants feelings towards product shopping ads on search engines

Showcase shopping ads follow similar trend, with over 60% of the respondents deeming them as informative and under 30% considering them as irritating and annoying. The rest of results are similar: credibility at roughly 14%, interactivity at almost 20% and, again, entertainment as the least picked feeling, with only around 8% of respondents choosing it.

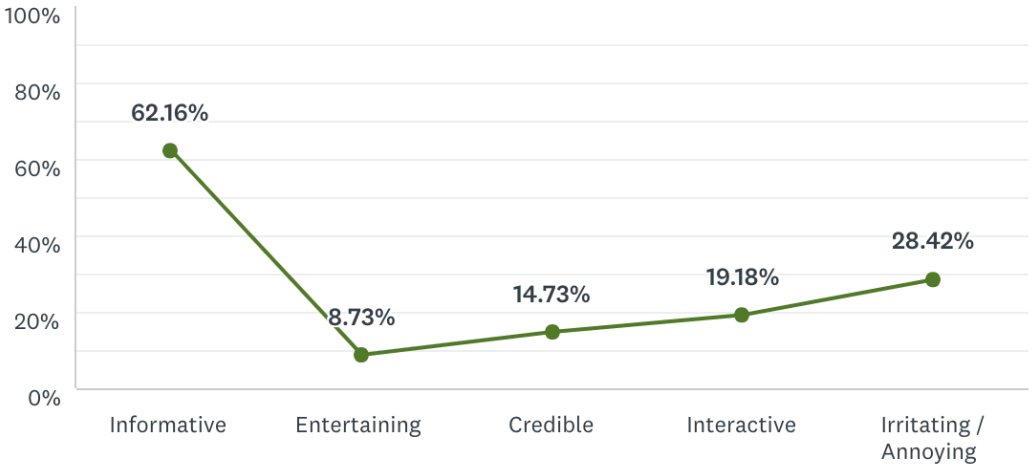

Figure 4.16 - Participants feelings about showcase shopping ads on search engines

Lastly, the carrousel ad format published on mobile applications. It has an overall positive attitude towards it, with almost 50% considering it as informative and only 37.33% as irritating and annoying, as shown in Figure 4.17.

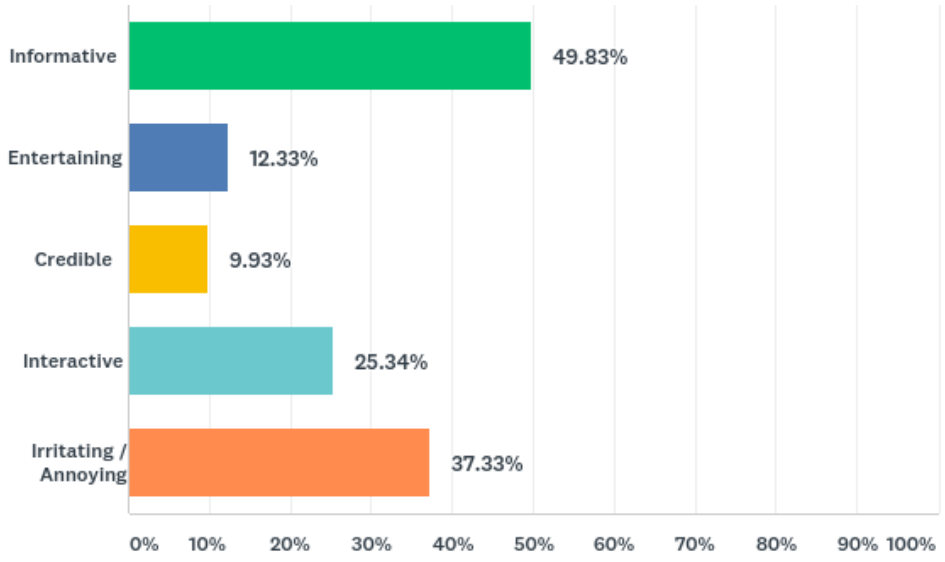

Figure 4.17 - Participants feelings about carrousel ads on mobile applications

Therefore, it is clear from this initial analysis that there are three online mobile advertising formats that stand out from the rest. They are product shopping ads and showcase shopping ads, both of them on the publishing platform search engine, and carrousel ads on mobile applications. What these three formats have in common is that they usually display a shopping product and not a service or game, and most likely on the search engine that the consumer was already searching a product.

The more intrusive interstitial ads and other ads that seem to interrupt mid experience during the interaction like video ads and messenger ads were the ones with less positive results. And as formats banner ads on mobile websites and applications and text ads on the same publishing platform follow the same trend, it seems that the consumer prefers to be helped by ads during the experience rather than being interrupted or bothered.

We will further investigate these issues in the next Section as there are ad formats like text ads on search engines and rich media ads that still offer ambiguity. Indeed, some respondents like them for sure but some don't. Hence a data drill down is needed to see if there are patterns that let us recognize what type of consumer likes them or not. All this in the context of the research hypotheses we have set out.

4.3. Research hypothesis testing and clustering

The first research hypothesis we set out states that "Millennials have a better attitude towards advertising being delivered through mobile apps". In order to test that, a data drill down on the question about publishing platforms by age is needed.

Figure 4.18 shows data from how participants aged between 25 and 34, which is representative of the millennial generation, answered what publishing platform they prefer receiving ads on and the results do not confirm the hypothesis, it actually refutes it, out of three publishing platforms it's the least chosen with only 30.14% of millennial respondents picking it, the search engine is the most favored with almost 37% of Millennials picking it.

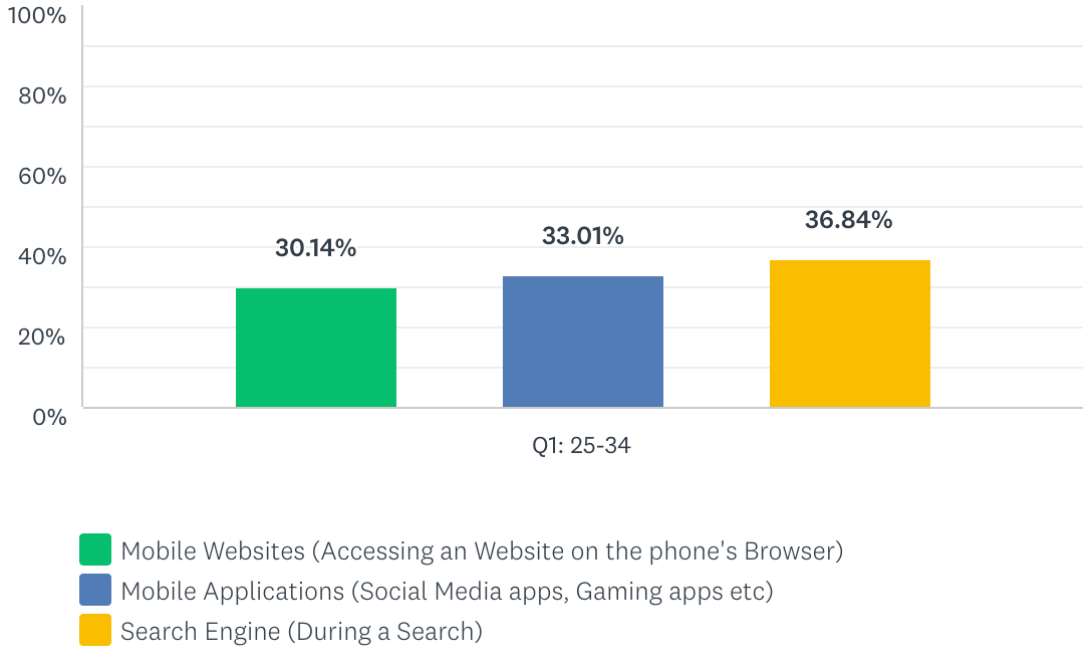

Figure 4.18 - Millennials preferred publishing platform

Keeping on the same subject, the second hypothesis was also about Millennials, it states that banner ads are less effective on that age group, in order to test this hypothesis answers from Millennials will be isolated on the question about banner ads, this information can be seen on figure 4.19. The results are in accordance with the hypothesis with over 61% of Millennials deeming banner ads irritating and annoying and only around 20% finding them Informative and Entertaining even less participants considered these formats Entertaining and Credible with only around 11% and 12% respectively. This confirms the hypothesis that Banner ads are generally less effective on Millennials since over 60% have a negative attitude towards them.

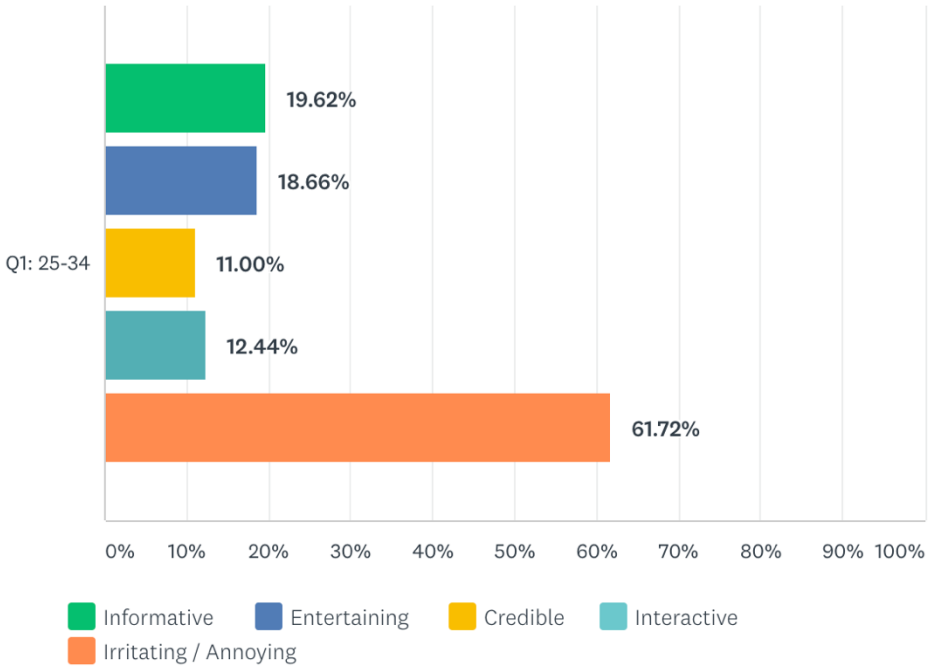

Figure 4.19 - Millennials feelings about Banner ads

Third research hypothesis involves generation Z, stating that "Generation Z's prefer interactive formats such as interactive mobile video and showcase shopping ads". Unfortunately, we were unable to collect enough data on that age group from the survey to make the necessary testing. Hence, this task cannot be accomplished and so it has to be left as future research.

The last hypothesis expresses that Rich media mobile application advertising format is more effective than banner advertising, to test this hypothesis the answers to both questions pertaining these formats will be compared, figure 4.13 pertains Rich media and 4.10 to banner advertising that can be viewed on the previous subchapter 4.2. The results are very favorable towards this hypothesis since banner ads have 10% more participants flagging it as irritating and annoying than rich media ads, banner ads also have over 60% of consumers deeming it has irritating and annoying. On the other hand, rich media ads have more participants considering them as informative with almost 29% of the total respondents while banner ads only have around 21%, most importantly and concurring with [5] conclusions about how rich media ads encourage viewers to interact and engage with the content more than banner ads, over 30% of the participants considered rich media ads interactive while only around 11% accounted banner ads as such. Credibility and Entertainment where slightly higher on banner ads but the difference is not relevant enough to take into account.

Now that the hypothesis are tested it is time to analyze the formats that had ambiguous results during subchapter 4.2, Text ads on search engines along with Rich media ads on mobile websites and applications had mixed results and to demystify these results k-means clustering technique was employed with participants demographics has variables and the answer to see if there are different responses in accordance with them.

The technique employed is referenced and explained on the previous chapter Methodology, to find the optimal value of k in k-means, the silhouette method score was used, k value will be chosen according with the highest silhouette score. The range of the Silhouette value is between +1 and -1 and a high value is beneficial and reveals the right number of clusters to employ.

Since on questions like age and country the data had a majority of responses favouring one answer, the clustering tended heavily towards these. But on matters like gender and type of mobile phone some differences started to arise. It cannot be said that age, country of residence or age are not a deciding factor in the attitudes of consumer towards online mobile advertising formats. The point is that we simply do not have enough data.

Table 4.2 - Relevant Clusters from Text ads question

Cluster	Age	Gender	Education	Country	OS	Feelings
0	25-34	Female	Graduated from college	United States of America	Android	Informative, Irritating and Annoying
1	25-34	Female	Graduated from college	United States of America	Android	Irritating and Annoying
2	25-34	Female	Graduated from college	United States of America	Android	Informative
3	25-34	Male	Graduated from college	United States of America	iPhone	Interactive

Table 4.2 represents the most relevant clusters found related to text ads. As it turns out, females from the United States of America that are graduated from college and use an android device are split between informative and irritating and annoying or even picking both to categorize their feelings; while men with the same education and the same country of residence

who use an iPhone tended to pick interactive to describe their feelings towards text ads on search engines.

The most relevant clusters created with the answers related to feelings about rich media ads are present in Table 4.3. Again, females graduate from college, resident in the United States of America and using androids are split between informative and irritating/annoying. On the other hand, males from the United States of America currently enrolling on college and using iPhones are seen as describing feelings of both interactivity and irritation and annoyance. This might seem odd since its both a negative and positive construct, but the negative attitude is still noted as a majority for this type of ad. Finally, a group of respondents who are college graduates from the United Kingdom and iPhone users picked entertaining as their choice, deeming these ads as somewhat appropriate to this demographic.

Table 4.3 - Relevant clusters from Rich media ads question

Cluster	Age	Gender	Education	Country	OS	Feelings
0	25-34	Male	2 years of college	United States of America	iPhone	Interactive, Irritating and Annoying
1	25-34	Female	Graduated from college	United States of America	Android	Irritating and Annoying
2	25-34	Female	Graduated from college	United States of America	Android	Informative
3	18-24	Male	Graduated from college	United Kingdom	Android	Entertaining

The remaining online mobile advertising formats have either very positive or very negative attitudes towards them. This makes it harder to find meaningful clusters since everything tends to go to the same answers, which put together with lack of answers, means that there is not enough information to achieve all the meaningful clusters on the demographics we were looking for.

4.4. Summary

Table 4.4 summarizes the main conclusions we have reached during this research, with a proper guide to advertisers to what online mobile advertising formats are more relevant and effective for their company or personal use. This is built upon the taxonomy developed in Chapter 3 and the consequent analysis of each format in Chapter 4.

Table 4.4 - Summary of attitudes towards each mobile ad format

Format	**Findings**	**Publishing Platform**
Text ad	Text ads on Mobile Websites and Applications are not advisable since they have a high probability of provoking feeling of Irritation and Annoyance on costumers and thus a high probability of ineffectiveness.	Mobile Websites Mobile Applications
Text ad	Text ads on Search engines are encouraged although they can create some irritation if the target audience is female, males appear to be more receptive to this type of format.	Search Engine
Banner ad	Banner ads on Mobile Websites and Applications are mostly ineffective	Mobile Websites Mobile Applications
Video ad	Video ads on mobile websites and applications are mostly ineffective since they create a feeling of irritation and annoyance towards them by most consumers.	Mobile Websites Mobile Applications
Rich Media ad	Rich media ads can be used but are not encouraged, consumers attitudes seem split on this format.	Mobile Websites Mobile Applications
App promotion ad	App promotion ad format use is discouraged although some users might find it informative.	Mobile Websites Mobile Applications Search Engine
Interstitial Ad	Interstitial ads on Mobile Application should be avoided at all costs, most of the consumers have negative attitudes towards this format	Mobile Applications
Showcase Shopping ads	Showcase shopping ads are fully encouraged, most consumers have a positive attitude towards this format thus making it more effective.	Mobile Applications Search Engine
Product Shopping ads	Product shopping ads are endorsed by this research as being effective with most consumers.	Search Engine
Call only ads	Call only ads are not effective with most consumers and its use is not recommendable	Search Engine

Messenger ad	Messenger ads are very intrusive during the experience and most users find them irritating and annoying deeming them ineffective for use.	Mobile Applications
Carrousel ad	Carrousel ads are helpful with engaging with the target audience on mobile applications, most consumers find them informative and interactive making it an overall effective format	Mobile Applications

Chapter 5 – Conclusion

5.1. Discussion

During this research it was possible to test three out of four research hypotheses we have proposed initially.

The first hypothesis was refuted, that is, Millennials turned out to have a worst attitude towards advertising being delivered through Mobile Applications when compared with other publishing platforms like the Search Engine and Mobile Websites.

The second hypothesis was confirmed, and Image/Banner ads are in fact less effective on Millennials, making this online mobile advertising format not suited to this target audience.

Furthermore, the fourth hypothesis was also confirmed, and Rich media mobile application advertising format is indeed more effective than banner advertising, rich media is a more viable option since it encourages users to interact and this is confirmed with the answers from the surveys participants that deem it more interactive than banner ads.

Unfortunately, the third hypothesis that referred to generation Z's preference towards interactive formats such as Interactive Mobile Video and Showcase Shopping ads was not able to be tested due to lack of survey data from this specific age group.

Besides the testing of the proposed hypotheses, this research led to other interesting findings. Firstly, over 60% of consumers in this research have a negative attitude towards mobile advertising in general. Secondly, the preferred way of receiving mobile advertising is while using the search engine instead of mobile applications and mobile websites.

Furthermore, it was possible to see how consumers from this group feel about each single online mobile advertising format. It turns out that carrousel ads on mobile applications, showcase shopping ads on both search engines and applications and product shopping ads on search engines were the ones that consumers had the most positive attitudes towards, making them in turn the most effective online mobile advertising formats of the ones proposed on the taxonomy. It seems that consumers prefer ad formats that help them during the experience of using the mobile phone. In this case all three formats display products that usually consumers are already searching for in the case of showcase shopping ad formats and product shopping ad formats that are published on the search engine while consumers are doing a research, carrousel ad formats on mobile applications are well presented and are possibly related to previous searches specially if it is on a mobile application like Facebook or Instagram.

Text ads is another ad format that is published on the search engine but in this case it didn't perform as well as product shopping ads or showcase shopping ads with consumers seeming

split in impressions, the main difference is that text ads do not display images unlike the latter two, it was found that this ad format is more advisable to a target audience with males since females tend to show more negative attitudes towards it in general.

Call only ads and app promotion ads are also published on the Search engine and underperform, call only ads is not a viable option for advertisers all together with a large majority of consumers having a negative attitude towards it and in turn leaving this ad mostly ineffective.

More intrusive ad formats like interstitial ads, video ads, messenger ads, text ads, app promotion ads on mobile applications had fewer positive results. It can be extrapolated that consumers prefer to be helped during their experience while using the mobile phone instead of interrupted or bothered.

In conclusion, the ad formats that had better results - showcase shopping ads and product shopping ads on search engines and carrousel ads on mobile applications - all have a few characteristics in common, namely:

- these ads have the support of images;

- they have a close integration with the experience of consumers while using the mobile phone, therefore helping them to make faster decisions and to pursue faster findings;

- they avoid interrupting the consumer mid experience (contrary to what video ads or interstitial ads might do), or avoid pushing a product or service (contrary to what app promotion ads on mobile applications and mobile websites might do).

5.2. Contributions to academic community and corporate world

This research presents some guidelines and findings that can be used in future academic or enterprise research, starting with the development of an advertising effectiveness framework that was expanded from past work and improved in this work. There are five feelings towards advertising which are Informativeness, Entertainment, Irritation, Credibility, Interactivity that alongside consumer demographics will define consumer attitudes towards advertising, which in turn determines if the ad is effective or, based on negative or positive attitudes towards the ad by the consumer. This framework was used to evaluate the effectiveness of different ads by format, but can also be used to compare effectiveness of whatever online mobile ads researchers or marketers want.

During the literature review process, we have faced a problem in respect to the lack of standardization of what constitutes an online mobile advertising format to the different organizations, companies and authors. For example, Google, Facebook, the Mobile Marketing

Association and several different authors have distinct takes. This research was able to overcome this problem by researching, aggregating and creating a sensible taxonomy of every online mobile advertising format currently used in the market in an organized form. Hence, the proposed mobile ad formats can help future mobile advertisement researchers and advertising companies to have a clear understanding of the variety of ad formats that exist in the market and so to have a basis upon which to start working on.

Although the online ad effectiveness framework and the mobile ad formats taxonomy can be certainly used as a reference point by future researchers, notice that these were created during this research to facilitate the testing of the hypothesis and the review of the different ad formats. Hence, a more in-depth literature and systematic review on the variety of ad formats and ad effectiveness is still recommended.

One of the most compelling findings in this research is that the communication of online mobile advertising is involuted and cannot be summed up to content alone, and the way the consumer receives that content carries a huge weight too, with different formats of delivery getting completely different reactions from consumers.

Companies should take the experience of the consumer into consideration, particularly when they want to keep its brand image. Attitude towards advertising is not only connected with the effectiveness of the ad but also with brand attitude and purchase intentions, and companies should take this into consideration. We believe that a well-established brand might lose some credibility and reputation by employing less favorable ad formats.

In this research it is outlined paths that companies should be taking in respect to different target groups and consumers in general, with the creation of a final summary table containing distinct online mobile ad formats and whether companies should use them or not and under what circumstances. Therefore, such summary may serve as a guide for companies initiating their online mobile advertising campaign.

5.3. Limitations

A significant constraint of this research relates to the size of the data sample that we were able to obtain from the survey. Actually, the target audience of this research was supposed to be all consumers from North America and Europe, that entails a large amount of answers, diverse age groups, levels of education and countries of residence. Unfortunately, that was short to be attained with only the 584 responses we have got. Of course, research was still put forward although it would have been better if more in-depth findings were made with more diverse data.

Furthermore, the survey was also shared through friends, family, work colleagues and acquaintances of the authors, which may rise the probability of biases in the survey responses and interfere with the final results in conclusions. Anyway, it is worth pointing out that not all the answers we have received fit into this category.

Another issue was that the survey's questions about each online mobile advertising format also had an image as an example alongside. And these images did not represent all the ways or contexts each ad format could be presented so they might have led some participants to answer in a way that they wouldn't do it otherwise.

A final limitation is the rapid change of the online mobile advertising environment with new applications and forms of integrating ads. They are arising at a rapid pace, so it is difficult to keep track of all ad formats and all the ways different companies and organizations are deploying their ads. This research tried to create a concise classification of mobile ad formats and all the different ways and platforms these ads can be published in. We believe we have managed such task properly but, as expected, this should be an ongoing work, so the taxonomy is continuously updated. For example, while we were carrying out this research, new applications were introduced, advertising companies evolved and even some ad formats or inventive online mobile advertising were dropped.

5.4. Future research

Needleless to say that research in this area is important for companies, consumers and daily users of smart mobile devices. Not only it contributes to making sure that consumers do not have bad experiences while using their mobile devices but critically to companies avoiding bad reputation and not wasting money on ineffective mobile advertisements.

Building up on this research, it would be interesting in the future to enhance the quality of the collected data from the survey, as well as improving the survey itself. Then with a larger sample size of North American and European consumers we may confirm the outcome of this study. Also, to further explore the intricate differences between attitudes toward online mobile advertising formats from the consumers of different countries, genders, education levels and other demographic classifications.

On the other hand, different types of products and services should be tested with distinct formats in order to understand if there are types of products and services that are better suited to a specific ad format or vice versa. By doing so, we further push the optimization of ad experience to costumers and safeguarding that companies in different sectors that are selling

contrasting products and services will have a working blueprint of online mobile advertising formats and publishing platforms that work in their favour.

Finally the third hypothesis that wasn't able to be tested during this research should be tested in the future to access that previous work is in fact reliable, this is important since this hypothesis relates to an younger and important generation that is setting out to shape the future, generation Z consumers are the next big thing and should be studied as such.

5.5. Personal note on Privacy

During the research we have developed a framework such that by, knowing consumers personal data like age, country of residence and level of education, it was possible to access whether or not a mobile ad format was effective. Although the process of data collection and usage helps companies to deploy more effective advertisement and possibly helping consumers with their experience, it must be clear for the users that their data is being collected, tracked and used.

We consider privacy a fundamental human right so companies and institutions should make an effort to be transparent with the personal data they are collecting, how they are using it and what is the data safety level in place. Consumers should also be given full control over their personal data and the possibility of doing whatever they want with it.

With more and more companies monetizing their costumers at the expense of privacy this is an issue that concerns us all, more products and services should be built with privacy in mind and users should be able to opt out of data collection processes or be made aware of them since the beginning of the experience.

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Annexes

Annex A

Mobile Advertising Formats

1. Demographic Details

* 1. Age

- ◯ Under 18
- ◯ 18-24
- ◯ 25-34
- ◯ 35-44
- ◯ 45-54
- ◯ 55-64
- ◯ 65+

* 2. What is your gender?

- ◯ Female
- ◯ Male

* 3. What is the highest level of education you have completed?

0 of 20 answered

* 4. In what Country do you live?

- ◯ Portugal
- ◯ Sweden
- ◯ United States of America
- ◯ Canada
- ◯ United Kingdom
- ◯ France
- ◯ Poland
- ◯ Norway
- ◯ Germany
- ◯ Spain

* 5. What type of mobile telephone do you PRIMARILY use?

- ◯ Regular cell/mobile phone (not a smartphone)
- ◯ Android
- ◯ iPhone
- ◯ Blackberry/RIM
- ◯ Windows Mobile
- ◯ I don't have a mobile phone

* 6. How do you feel about Mobile advertising in general?

- ☐ Annoying
- ☐ Entertaining

0 of 20 answered

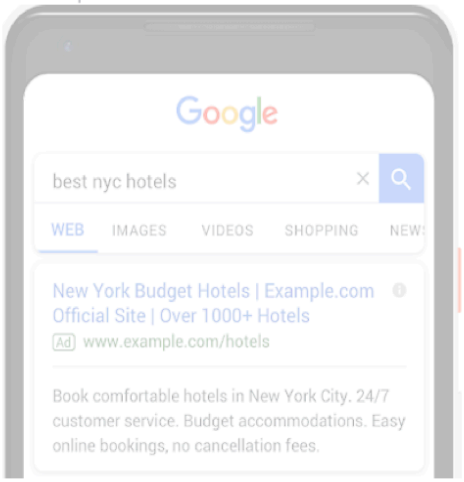
- [ ] Helpfull/Informative
- [ ] Interactive
- [ ] Credible

* 7. I prefer receiving mobile advertising on

- ◯ Mobile Websites (Accessing an Website on the phone's Browser)
- ◯ Mobile Applications (Social Media apps, Gaming apps etc)
- ◯ Search Engine (During a Search)

* 8. Text Ads on Search Engines are often ....

Example:

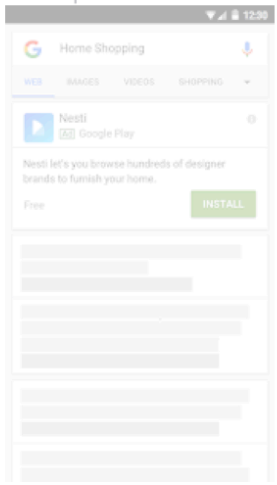


0 of 20 answered

- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 9. App promotion ads on Search Engines are often...

Example:

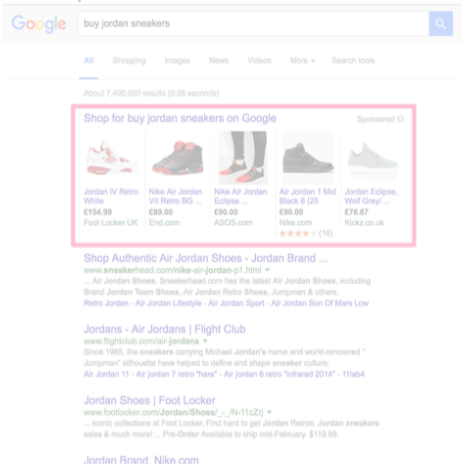


- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 10. Product shopping ads on Search Engines are often ...

0 of 20 answered

Example:

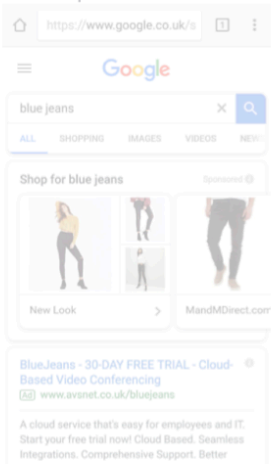


- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 11. Showcase Shopping ads on Search Engines are often...

0 of 20 answered

Example:



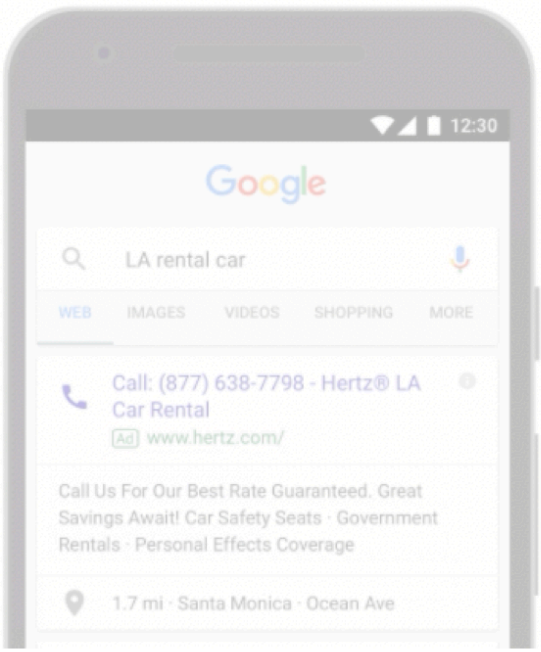
(These ads expand when clicked showing several products from a store)

- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 12. Call Only ads are often ...

0 of 20 answered

Example:

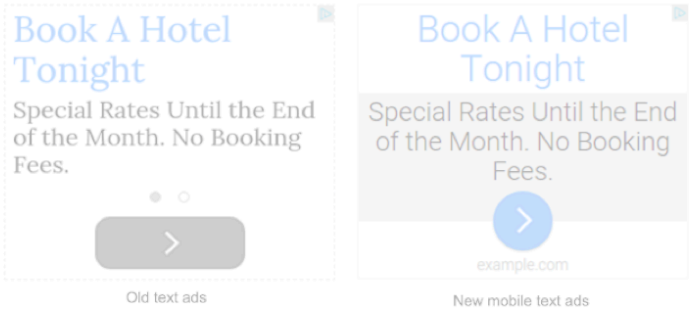


- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 13. Text ads on Mobile Websites or Applications are often...

0 of 20 answered

Example:



- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 14. Banner ads on Mobile Websites or Applications are often...

Example:

0 of 20 answered

0 of 20 answered

- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 15. Video ads on Mobile Websites or Applications are often...

Example:

- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 16. Rich Media ads on Mobile Websites or Applications are often...

Example:

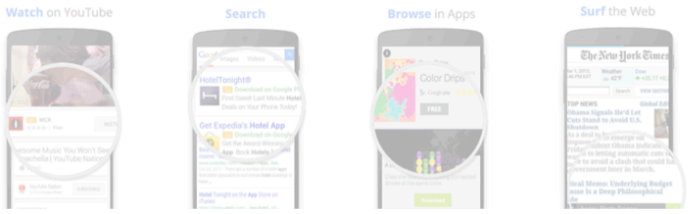
0 of 20 answered

(Rich Media ads give the option of interactivity with the user)

- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 17. App promotion ads on Mobile Websites or Applications are often...

Example:

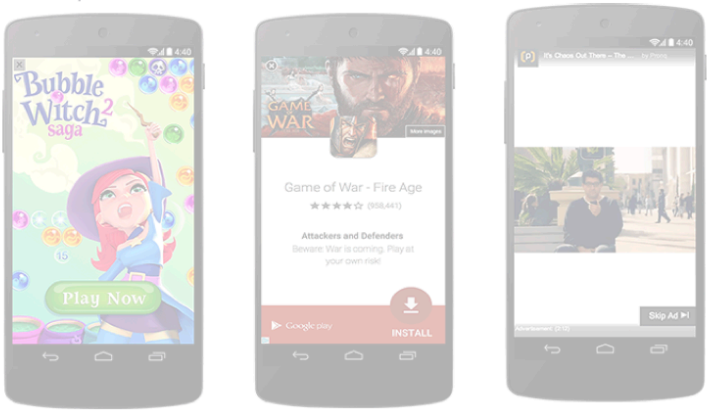


0 of 20 answered

- [ ] Informative
- [ ] Entertaining
- [ ] Credible
- [ ] Interactive
- [ ] Irritating / Annoying

* 18. Interstitial Ads on Mobile Applications are often...

Example:



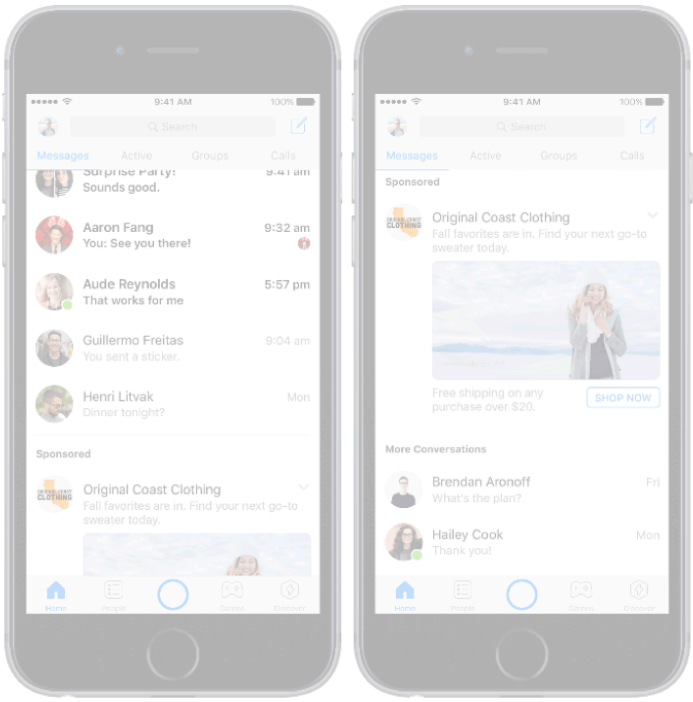
(Full-screen advertisement, which may be placed as a “bumper” screen for the launch and exit of the application, or as a splash or jump page within the application)

- [ ] Informative
- [ ] Entertaining
- [ ] Interactive
- [ ] Irritating / Annoying

0 of 20 answered

* 19. Messenger ads on Mobile Applications are often...

Example:

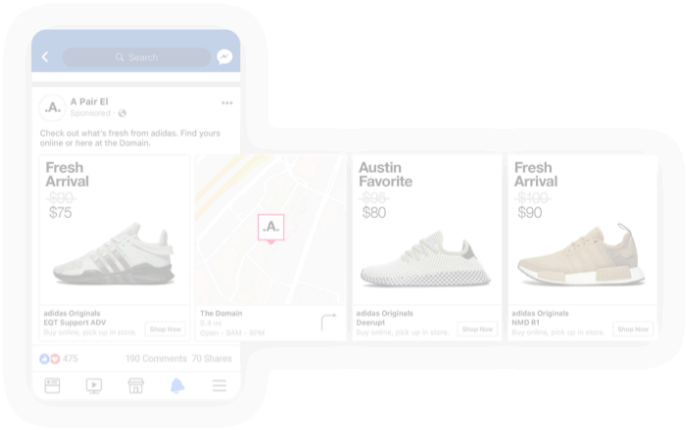


- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

* 20. Carrousel ads on mobile applications are often...

0 of 20 answered

Example:



- [ ] Informative
- [ ] Interactive
- [ ] Entertaining
- [ ] Irritating / Annoying
- [ ] Credible

DONE

0 of 20 answered