

# The management of advertising algorithms on the Internet. A case study: Facebook and Google

## *La gestión de los algoritmos publicitarios en Internet. Un caso de estudio: Facebook y Google*



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### **Abstract:**

The birth of the Internet and the new information and communication technologies have generated a new communicative paradigm. In fact, it has also generated a new advertising paradigm with multiple opportunities obtained through segmentation or the inclusion of algorithms in search engines or social networks for product promotion. Besides, there is the ability to measure the results achieved. In this regard, this research addresses the management of advertising algorithms executed in Facebook ADS and Google AdWords tools as a new online advertising model compared to traditional approaches. Therefore, a qualitative and quantitative methodology has been chosen to gather the information (using interviews and surveys) to deepen into the differences between the conventional advertising management and online advertising. Among the results obtained, we may advance that advertising has led to a new scenario where machine learning will condition the future of advertising with the help of big data and content programming.

### **Keywords:**

Algorithms; Internet; Google; Facebook; online advertising.

### **Resumen:**

*El nacimiento de Internet y las nuevas tecnologías de información y comunicación no solo han generado un nuevo paradigma comunicativo, sino también publicitario con múltiples oportunidades obtenidas en base a la segmentación, la promoción de productos mediante la inclusión de algoritmos en los buscadores y en las redes sociales, además de la capacidad para medir los resultados logrados. Al respecto, esta investigación aborda la gestión de los algoritmos publicitarios ejecutada en las herramientas Facebook ADS y Google Adwords como un nuevo modelo de la publicidad online frente a los enfoques tradicionales. Para ello y, con la finalidad de ahondar más sobre las diferencias entre el sistema de gestión publicitaria convencional y la publicidad online, se ha optado por una metodología tanto cualitativa como cuantitativa basada en la utilización de la entrevista y la encuesta, respectivamente, como métodos de recolección de datos. Entre los resultados obtenidos puede avanzarse que la publicidad ha derivado en uno nuevo escenario en el que el machine learning condicionará el futuro de la publicidad ayudándose del big data y la programación de contenidos.*

### **Palabras clave:**

*Algoritmos; Internet; Google; Facebook; publicidad online.*

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## 1. Introduction and State of the Question

The Internet has meant an unprecedented transformation in both communication and advertising. The evolution has been constant. Pérez (2020) points out that conventional “Above the Line” advertising has given way to a new understanding advertising message dissemination by means of “Below the Line” supports via email marketing actions or social networks advertising.

In this regard, Muela (2008) states that the Internet has contributed to democratize advertising by becoming an accessible tool. On the one hand, advertising investment on the Internet by companies has grown “compared to television, press and magazines that are falling, although its digital side is also growing” (Sanchez, 2019, 10). On the other hand, digital advertising attractiveness lies in the inclusion of elements that are easily accessible to audiences. De Salas (2010) argues that both social networks and Internet search engines have made possible for all types of companies and institutions to carry out advertising campaigns without prior knowledge or huge budgets.

Accordingly, González (2014) argues that Facebook and Google manage millions of people’s data around the world by controlling the large Internet advertising market through search and promotion algorithms configuration. This author inquires about the value proposition provided by Facebook and Google trying to explain the reasons for their differences with respect to other technology companies such as Twitter and Yahoo!

For Boyd (2018), one of Facebook’s keys for success has resided in the inclusion of an algorithm that has been improving as this social network average user has done so. The expert highlights that publications, whether organic or advertising, are directed towards all the people’ accounts registered in this network, guaranteeing an immediate effect.

Likewise, it is relevant to describe what an algorithm is, in order to understand the study relevance with deeper appreciation. This concept, according to the Royal Spanish Language Academy, refers to different mathematical calculations applied with the purpose of finding a coherent solution in the presence of multiple problems framed in various contexts.

Peña (2018) explains that algorithms are sets of rules, applications and instructions that, systematically applied to an input data package, with a specific format, serve to solve a wide cataloguing of problems, challenges and unknowns present in today’s societies. In this sense, Steiner considers that:

An algorithm is, in essence, a set of data and instructions to be superficially applied in order to obtain a pre-established result. The information enters a given algorithm and the possible answers coming out from it, will be stored in terms of user information (2012, 64).

Saéz (2020) describes that the 21st century is characterized by the emergence of automated decisions, i.e., choices made or based on the use of artificial intelligence (AI) applications and algorithmic systems, which, with or without human intervention, achieve decision-making effects on people.

Similarly, Alonso and Fernández (2021) highlight that the algorithm is one of the most notorious parameters existing in the creation of contemporary culture by forming an indisputable part of the processes of organization, socialization, communication and dissemination of information through the Web 2.0 space.

In this regard, computers calculate data faster than the human brain. Algorithms, according to the aforementioned author, are used not only to collect data related to users' identities, but to predict electoral results, behaviours or consumption habits as well. Therefore, algorithms are introduced in all social spheres and areas.

In relation to the above, Rodriguez (2021) states that algorithms are programmed systematic operations to calculate the previous actions that may occur facing certain problems. This theorist highlights the existing link between machine learning and algorithms considering that they develop specific actions aimed at programming technological platforms, and data capture systems and programs.

On the one hand, Montells (2021) points out that Facebook uses several algorithms, being Edgerank one of the most important. This element determines the publications displayed to a registered user based on the activity produced by him/her. Therefore, Edgerank is a set of calculations, formulas and improvements established by Facebook with the aim of establishing the type of content viewed by each registered profile. For Grané (2021), algorithms constitute a structured, created and determined set of specific steps that have produced an enormously relevant concept today. In this regard, algorithms are hidden in social networks as Facebook, in such a way that algorithms like EdgeRank determine the contents, images or videos shown on Facebook timeline.

On the other hand, Google also uses its own algorithm: Pagerank. Authors such as Barriola et al. (2016) argue that Larry Page and Sergey Brin created this algorithm in 1998. Pagerank ranks websites relevance paying attention to the links generated by a page. For example, if website A contains a link to web page B, Pagerank interprets that the content generated by B is relevant for web A and therefore indexed. Once a first approach to the theoretical concept of algorithm has been made, it is relevant to justify the choice of the study object. According to Enberg (2019), Facebook and Google represent two of the most important and fastest growing platforms in terms of advertising campaigns management on the Internet through algorithms inclusion.

For the aforementioned author, the algorithms used by both companies are fundamental to understand more the current advertising scenario dominated by the presence of an advertising dynamic that is increasingly persuasive, hyper-segmented and aimed at the Internet consumer. Therefore, it is necessary to know how these companies' algorithms work, leading to a new advertising concept far from conventionalisms.

In this regard, advertising algorithms could not be understood without digital consumers' data management. This is what is known as big data. Authors such as Franks (2012) recognize that big data is real and here to stay. Far from being perceived as a passing or one-off fad, user data management (e-mails, postal addresses, telephone numbers or social profile addresses, among other information sources) has become a complex reality.

Ortiz (2021) states that big data is a term used to conceptualize a large amount of data or a combination of them so that the description, storage and processing of information derived from this data accumulation acquires a notorious importance. Algorithms process daily decisions and data related to the use of technological platforms like Facebook and Google, among others.

Companies such as Facebook and Google know how to use Internet users' data to obtain a substantial profit. However, authors like Zuazo (2018) highlight the existing opacity around algorithms management, knowledge and use by the aforementioned

companies. The expert highlights that few employees, managers or engineers share data on the algorithms' actual functioning inside and outside these companies.

Dermak (2017) adds that once the algorithm gets the precise and needed information, it is able to transform the data obtained into a very powerful asset that technology sector companies are not willing to share. In relation to this, and once an adequate theoretical definition of the study object of this research has been provided, it is necessary to describe the work's objectives, which are the following:

- Objective 1. To analyse advertising algorithms management in Facebook ADS and Google Adwords as they are two of the advertising channels or supports most used by companies.
- Objective 2. To describe the criteria used by algorithms, in addition to automated functionalities.
- Objective 3. To address the existing differences in advertising algorithms in terms of budget allocation, ad optimization and audience detection.

Likewise, several starting hypotheses are raised within the present research, which are set out below:

- Hypothesis 1. Facebook and Google algorithms perform better advertising campaign budget allocation as compared to manual allocation. Algorithms predictive ability and impact are greater than human knowledge.
- Hypothesis 2. Facebook and Google algorithms allow a higher level of created ads analysis based on measurement criteria, impact and audience penetration that are difficult to detect by professionals running advertising campaigns.
- Hypothesis 3. Facebook and Google's advertising algorithms serve to reach audience groups that are related to products, brands and services when compared to the manually reached segmentation.
- Hypothesis 4. Facebook and Google's advertising algorithms are one of the keys to the success of these platforms, which do not clearly reveal how they work and handle the information, data and other elements compiled.

### *1.1. Online and programmatic advertising conceptualization*

It is necessary to analyse the evolution of advertising to understand the boom and subsequent consolidation that both online and programmatic advertising have experienced. The communication paradigm change has shaped a new reality where consumers and brands converge with each other in multiple scenarios.

Alcalá (2021) states that, with the appearance of the Internet in 1989, there was a great change dealing with supply, demand and advertising campaigns' creation, with a progressive modernization process on the part of advertisers. For their part, experts such as Papi-Gálvez et al. (2014) state that segmentation, personalization and participation are the three unique online advertising distinguishing features, being the three potential attraction factors for many companies.

Tobias, Vallejo and Hinojo (2021) argue that online advertising has become one of the most important tools for companies to reach consumers in today's societies. The accumulation and exploitation of data obtained through digital programs offer a wide range of possibilities for personalization, measurement and negotiation of Internet users' information through multiple options.

However, the multiplicity of models has not always been like that. Martínez, Segura and Sánchez (2011) do not hesitate to confirm that the evolution of Internet advertising should be understood under a holistic approach including what is known as Web 1.0, or the static 1990 web, Web 2.0, established at the beginning of the new millennium, and finally, semantic or Web 3.0. Regarding advertising evolution at the dawn of the Internet and social networks, De Salas (2011) considers that online advertising offers an added value based on the very act of selling an article or product, reinforcing not only the consumer's brand adhesion, but also the symbolic discourse implicit in any advertising action. Ramos (2006) describes that the current online environment has served to promote the creation of a perfect symbiosis between advertising and entertainment whose main purpose is to capture the public by using shocking, daring and original messages.

Similarly, online advertising is related to programmatic advertising by sharing origin and features. Rodríguez (2016) points out that the advertising processes automation is a constant fact, with unstoppable growth and a high probability of becoming an increasingly effective advertising investment model.

Villarreal (2022) states that programmatic advertising is a type of online advertising characterized by the automated, targeted and segmented purchase of Internet advertising spaces that are chosen based on the audience and its characteristics. Programmatic advertising connects brands with consumers in a clear, effective and fast way, generating a more direct link between the two. In this way, a native or automated advertising strategy is generated.

The fast evolution of the Internet has led to the emergence of programmatic advertising design platforms. In 1994, the online magazine HotWired, in collaboration with the American telecommunications company AT&T, was the first company to devise a sale model of digital advertising space, breaking into a new way of monetizing the expenditure and profit obtained in advertising purchase and sale.

This gave rise to the cost per thousand impressions (CPT), a model where the advertiser only pays for the number of times the ad is shown to users. Later, Facebook, through the Facebook Business Manager tool allowing the advertising campaigns management, and Google, through Google AdWords, have established an auction and cost per click model (CPC, hereinafter) determining a new way of advertising.

The union of CPT and CPC means the establishing of programmatic advertising, a buying and selling Internet spaces modality that not only impacts among consumers, but also saves time and resources in what has to do with advertising management. For Placebo Media (2016), the advertising space purchase through direct bidding (RTB, hereinafter) involves the use of technology that allows buying, selling and collecting impressions under a real-time bidding paradigm, automatically achieving impressions after impressions, users and reactions based on products, services and brands segmentations. In relation to the above, Sevillano points out that:

RTB means the capacity to purchase advertising space in an automated way, access inventory and buy it in real time without human intervention and programmatic advertising goes further in the sense that it starts from the parameter that the buying party decision making chooses which advertiser and values how much it is willing to pay for a user, i.e., who (s)he is, their interests, the user relevance for the brand (2015, 10).

Programmatic advertising could not be understood without Facebook Business Manager and Google AdWords. Costalago (2019) confirms that, in Google's case, the appearance of Google Adwords advertising tool in 2004 has meant the programmatic

advertising consolidation. For this author, Google Adwords has become the main system for buying Internet advertising space, far ahead of other tools such as Facebook Business Manager.

The advertising campaigns management through Facebook Business Manager not only allows the selection of very specific campaign aspects such as user locations, audience interests, impacts duration and advertising budgets, but also offers the opportunity to synchronize the results achieved with other networks such as Instagram.

### *1.2. Big data, Artificial Intelligence (AI) and Machine Learning*

It is clear to understand the importance of capturing user data, i.e., big data. In this perspective, Puyol (2015) considers that big data is the massive volume of data that adopts the information collected through the Internet. The intrinsic meaning of big data points to the great opportunity offered by technological tools.

Other authors such as Chen et al. (2013) describe big data as an information asset of high volume, speed and variety that requires cost-effective decision making and the application of novel data collection formulas. For Camargo-Vega, Camargo-Ortega and Joyanes (2014) the term big data concentrates a series of characteristics such as the following:

- Accumulation of data complex to analyse without specific tools.
- Big data processing and analysis.
- Application of procedures that allow the creation of big datasets.
- Information analysis and processing to extract novel ideas.
- Technological development that makes the use of big data more economical.
- Consolidation of a company's information to make it available to the public.

Raya (2015) considers that the information currently managed by companies through data capture on the Internet must guarantee the users' non-discrimination. For this purpose, various algorithms are used to ascertain a unified data treatment. Estera (2016) confirms that big data constitutes a fundamental part of the strategies created by both companies and the State with the aim of processing data more efficiently.

Similarly, big data could hardly be understood without AI, a concept in vogue in recent years but which is not recent. Marvin Minsky was one of the first theorists to outline a definition of this term in 1968. Minsky (1968) confirmed that AI origin should be understood under the figure of Alan Turing, one of the first mathematical algebra pioneers. For Peña (2010), there were various problems shown to require the use of technology to find solutions adapted to the challenges created from about the middle of last century.

Both Google and Facebook employ AI with the aim of improving user experience, advertising campaigns investment and web interface. Han (2014) does not hesitate to state that both companies' algorithms analyse the signals sent by users every time they browse their platforms.

Predicting behaviour and consumption habits of Internet users is one of the most important purposes of programmatic advertising. For this purpose, Facebook and Google use AI as a very useful tool. In the opinion of Vallverdú (2019), algorithms'

use should not be understood without the usefulness provided by artificial intelligence (AI) in the difficult and complex task of anticipating consumer needs.

It is complex to understand how the advertising algorithms used by the companies studied in this article work. For this reason, it is necessary to analyse what the concept of machine learning involves. For Mitchell (1997) this term describes automatic learning. The essence of machine learning consists of the processing and selection of information obtained through big data application. Algorithms make predictions about Internet users' behaviour thanks to machine learning, which for Gupta (2017), is fundamental in online and programmatic advertising.

Jung (2022) states that machine learning aims to predict or guess the features that a dataset presents. Any machine learning method must be based on the implementation of infinite computational resources to obtain the largest amount of informative data.

In light of the above, authors such as Martínez, Aguado and Sánchez (2022) describe that AI impact on advertising is relevant for three reasons. The first involves the advertising business model transformation because of the Internet and online advertising platforms like Google AdWords. The second one refers to the technological change experienced in advertising and digital native industries. The third and last one has to do with AI strategic interest in the digital societies of the 21st century.

However, programmatic advertising managed through strategies including algorithms and AI leaves behind multiple criticisms. Iniesta-Alemán et al. (2018) claim that more conventional advertising agencies may eventually disappear because advertisers will be autonomous in campaign management.

## 2. Methodology

The present work is characterized by a qualitative and quantitative methodological approach based on the use of a structured interview and a survey, respectively. In view of the above, Vargas (2012) describes that the structured interview is defined by the design of a series of questions to be answered based on a predetermined limit of responses. Therefore, this type of interview is elaborated in advance and is posed to the participants with rigidity and systematization.

Lucca and Berríos (2003) consider that this type of interview is very formal, allowing the interviewer to compare the information obtained based on the answers given by the interviewees. Del Rincón, Arnal, Latorre and Sans (1995) say that in the structured interview the interviewer asks each of the interviewees different questions with a prior limitation of answers. In this regard, the aforementioned authors emphasize that a protocol of prefixed questions and answers is elaborated and must be followed with rigidity and no improvisation.

For their part, Denzin and Lincoln (2005) argue that the researcher carries out a prior planning of all the questions he wants to ask. To do so, he/she must prepare a script with the questions sequenced and ordered. Similarly, the interviewee may not make comments, value judgments or appreciations. The questions have a very specific nature: they are closed.

This implies that the answers can be affirmative, negative or specific on a series of possible answer options. In addition to what has been described, Diaz-Bravo, Torruco-García, Martínez-Hernández and Varela-Ruiz (2013) confirm that the structured interview must include a set of categories or possible options for the subject to choose from. The interview has to be applied

rigidly to all research participants, so that the order in which the questions are asked and the answers obtained are always the same.

After the above, other aspects related to the present research are presented. First, an initial phase based on the execution of a bibliographic study was carried out to contextualize the present study object from the perspective of contemporaneity. Secondly, a survey was designed with 10 questions that included an evaluation method using five variants of responses ranging from 1 (totally disagree) to 5 (totally agree).

The sample is composed of three hundred professionals (in different locations in Europe, Asia and USA) related to programmatic advertising, advertising algorithms management on Facebook and Google and user database management. The number of participants has been established at three hundred (one hundred for each geographical area) due to the specific nature of the sample, i.e. professionals who accredit having the Certificate in Data Analytics Professional (known as CDAP) and the Professional Certificate in Data Analytics (known as PCDA) issued by Google Global. The contact with the participants was executed through a previous stage of profiles search and selection carried out by the researcher.

For reasons of compliance with the current European regulations of the Organic Law on Data Protection (OLDP, hereinafter), the specific personal data of each of the interviewees have been concealed, guaranteeing both anonymity and the correct treatment of the recapitulated information during the research course. Due to the geographical disparity of the respondents, the data collection process was carried out online. All survey participants took part in the survey with no unanswered questions or blank items. In this regard, all participants of the present study received an e-mail with a link containing the survey. The survey template provided is shown below.

**Table 1. Survey model designed in the research**

Questions	Value 1	Value 2	Value3	Value 4	Value 5
1. Machine learning and the functionalities of Facebook and Google's advertising algorithms are fundamental to my online strategy.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
2. The inclusion of automated actions through programmatic advertising on Facebook and Google is essential to improve campaign results.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
3. The automatic allocation of budgets in advertising campaigns on Facebook and Google enables better results than manual allocation.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
4. The automatic allocation of budgets in advertising campaigns allows me to save time and resources in terms of advertising management.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree



5. Facebook and Google's algorithm allows me to reach a group of like-minded audiences more accurately than manual segmentation.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
6. Facebook and Google's advertising algorithms are more efficient in detecting creatives improving conversions compared to manual management of creatives.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
7. The future of online and programmatic advertising depends on the knowledge of Facebook and Google's advertising interfaces.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
8. Digital advertising campaigns increasingly require the use of algorithms and automation that Facebook and Google offer.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
9. The evolution of machine learning will increasingly include actions performed by algorithms as opposed to services provided by human capital.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree
10. The handling of information from big data is crucial to understand the proper functioning of advertising algorithms.	Totally disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Totally agree

**Source: prepared by the author**

Similarly, the interview was used as a data collection tool. For this purpose, a sample of three hundred profiles has been designed, these being different from those participating in the survey. This is intended to guarantee not only the greatest possible data plurality, but also to ensure the information contrast and its objectivity. Accordingly, the interview participants' selection was carried out following the same requirements and patterns as with the survey. The interviewees profile has been defined in three typologies defined below.

1. Executives (from technology sector companies) who manage online and programmatic advertising teams that design advertising campaigns.
2. Internet advertising sector professionals, with proven experience in campaign implementation through algorithm management.
3. Facebook and Google partners with extensive knowledge on both algorithms and platforms operation.

Likewise, and in compliance with the legal precepts contained in the current OLDP, the anonymity of the interviewees is guaranteed. The interview model is attached below.

**Table 2. Interview model**

<p>1. What are the competitive advantages of including automated functionalities by Facebook and Google?</p> <ul style="list-style-type: none"> <li>-It helps in what is involved with creative process and decision-making.</li> <li>-It simplifies tasks, saves time and resources.</li> <li>-It boosts campaign results.</li> </ul>
<p>2. What areas generate some distrust regarding advertising algorithms effectiveness?</p> <ul style="list-style-type: none"> <li>-Human hand substitution vs. technology inclusion</li> <li>-Use complexity</li> <li>-Difficulty in establishing a decalogue or good practices guide</li> </ul>
<p>3. Do you consider that both machine learning and advertising processes automation will result in the reduced inclusion of specialized personnel in advertising campaign management?</p> <ul style="list-style-type: none"> <li>-No. The inclusion of human resources will continue to be an essential asset.</li> <li>-Yes. Algorithmic technology will undoubtedly play an increasingly important role.</li> <li>-It will depend on each company, but machines will not be able to overtake humans.</li> </ul>
<p>4. Is it dangerous or controversial to automate so many functions by including advertising algorithms in platforms like Facebook and Google?</p> <ul style="list-style-type: none"> <li>-No, because it is necessary to perform a weighted assignment of tasks.</li> <li>-Yes, because more and more actions are performed automatically.</li> <li>-There is no clear or evident risk at the moment.</li> </ul>
<p>5. Do you think that the trend of investing more and more in Facebook and Google advertising will continue in the coming years or will companies return to conventional advertising campaigns?</p> <ul style="list-style-type: none"> <li>-Yes. This will continue to be the case and will even increase.</li> <li>-No. More and more companies are choosing hybrid campaigns.</li> <li>-It will depend on each campaign, budget and advertising management.</li> </ul>
<p>6. Being a Facebook and Google partner, why do you think both platforms are so opaque when it comes to how the algorithms work?</p> <ul style="list-style-type: none"> <li>-The lack of transparency has to do in part with advertising success.</li> <li>-Because if algorithms were disclosed, they would cease to exist.</li> <li>-The main reason for this is that advertising management generates very high profits.</li> </ul>
<p>7. Could Facebook and Google get more advertisers if they were more transparent about advertising algorithms management?</p> <ul style="list-style-type: none"> <li>-Yes, especially for SMEs and companies with little knowledge of online and programmatic advertising.</li> <li>-No, because Facebook and Google continue to reach advertisers and will do so regardless of the information that they release to the outside.</li> <li>-Possibly, if this were the case, more and more companies would better understand why to invest in online advertising.</li> </ul>
<p>8. What characteristics should online and programmatic advertising experts and campaign managers meet?</p> <ul style="list-style-type: none"> <li>-Algorithms require specific knowledge, so new job profiles will appear.</li> <li>-Online and programmatic advertising requires competitive profiles that adapt to the new advertising and technological realities as opposed to more conservative profiles.</li> <li>-New positions and job opportunities will emerge for the most active profiles.</li> </ul>

9. Could conventional advertising agencies disappear due to online advertising growth, and its multiple advantages such as the ability to generate little budget advertising?

-Traditional advertising agencies will have to offer additional value to avoid disappearance or becoming Facebook and Google network add-ons.

-More conventional agencies must clearly distinguish themselves from other agency types growing in strength.

-They will not disappear, but they will be reduced.

10. What would be your recommendation, as an online advertising professional expert, for all profiles specializing in programmatic advertising and advertising algorithms management?

-To be trained through master's programs, specific courses and contents.

-To be self-taught by reading manuals, attending conferences...

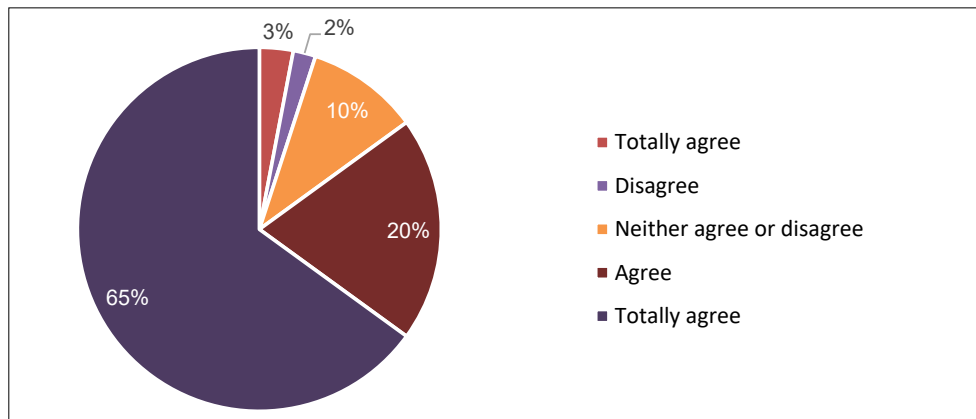
-To keep a continuous training attitude in a changing scenario.

Source: prepared by the author

## 4. Results

### Survey results

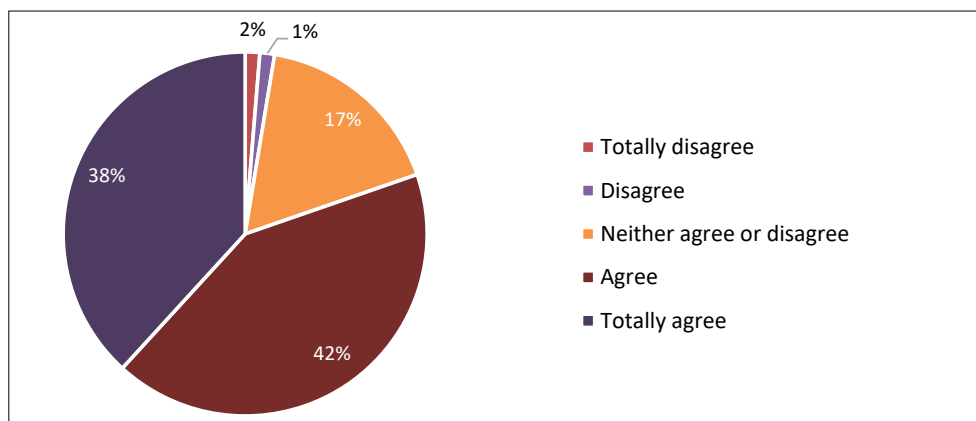
**Chart 1. Machine learning and the functionalities of Facebook and Google's advertising algorithms are fundamental in the online strategy I carry out**



Source: prepared by the author

Sixty-four point five percent of the participants stated that they totally agreed with the importance that both Facebook's and Google's advertising algorithms have on the management of online advertising campaigns, compared to 28.9% who somewhat agreed with this statement. A figure of 3.9% clearly indicated that they neither agreed nor disagreed, and finally 2.6% of the respondents who stated that they totally disagreed.

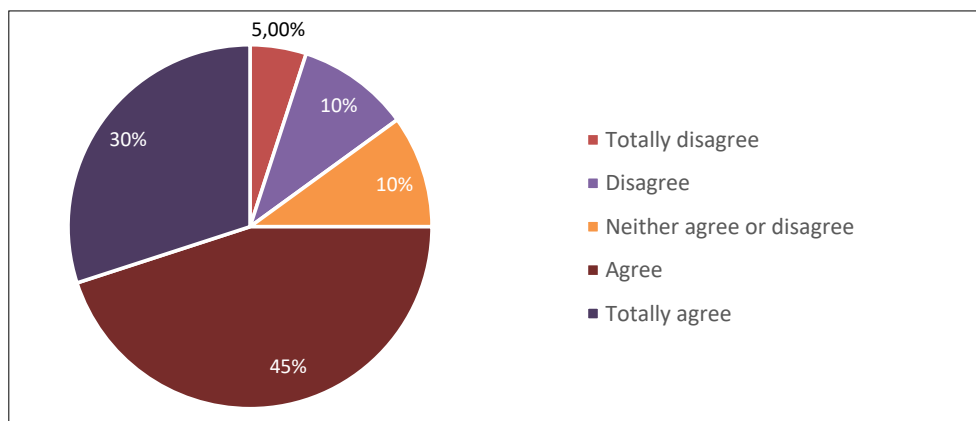
**Chart 2. The inclusion of automated actions through programmatic advertising on Facebook and Google is essential to improve campaign results**



Source: prepared by the author

Thirty-eight point two percent of the respondents did not hesitate to consider that the inclusion of automated actions in programmatic advertising is appropriate for achieving better results. Forty-two point one percent agreed with this statement. Similarly, Seventeen point one percent of respondents neither agreed nor disagreed, and finally 1.3% disagreed.

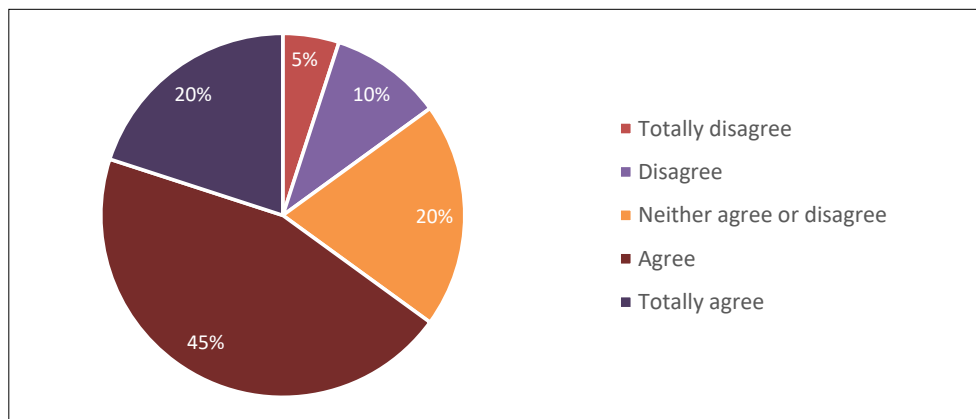
**Chart 3. Automatic allocation of budgets in advertising campaigns on Facebook and Google leads to better results than manual allocation**



Source: prepared by the author

Forty point eight percent of the participants stated that they agreed with the statement made in question 3, compared to 31.6% who stated that they completely agreed. Compared to these percentages, 14.5% disagreed with the statement, stating that manual assignment is more relevant than automatic assignment. Similarly, 2.6% of the participants totally disagreed and 10.5% of those surveyed said they neither agreed nor disagreed.

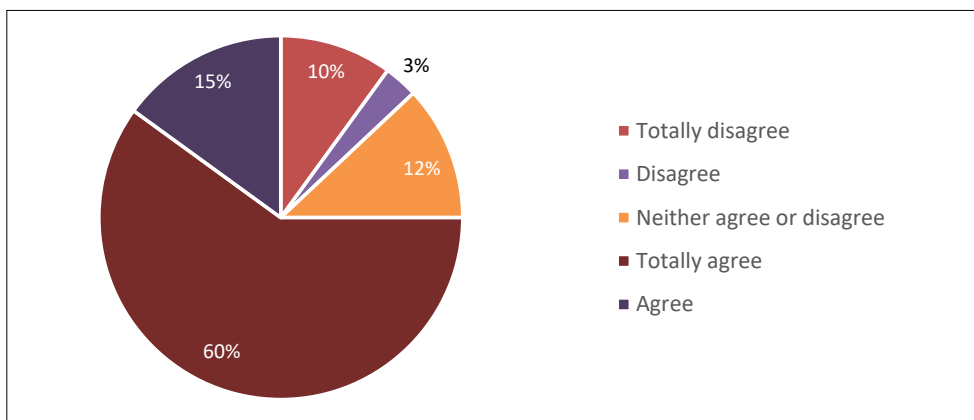
**Chart 4. The automatic allocation of budgets in advertising campaigns allows me to save time and resources in terms of advertising management**



Source: prepared by the author

A total of 44.7% of the respondents agreed with the time reduction implied by budget automation, compared to 18.4% who totally agreed and another 18.4% who neither agreed nor disagreed on this issue. Similarly, 15.8% of the participants somewhat disagreed with this statement, compared to 2.6% who completely disagreed.

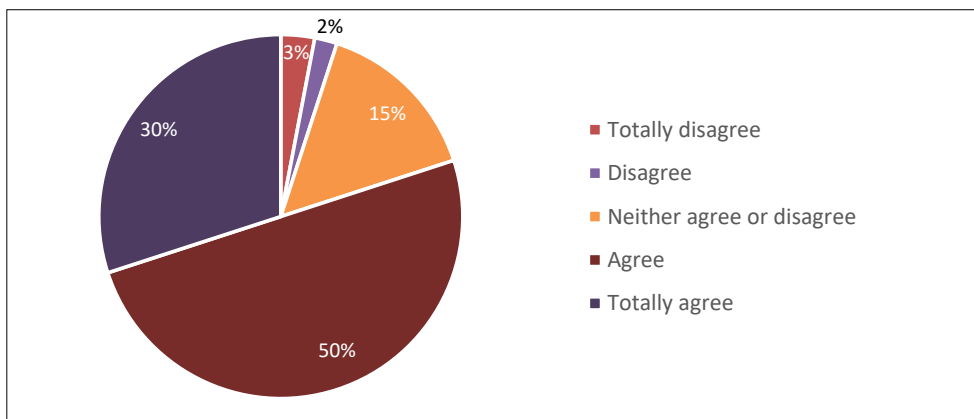
**Chart 5. Facebook and Google's algorithm allows me to reach a group of related audiences more accurately than manual segmentation**



Source: prepared by the author

Sixty point five percent of respondents completely agreed with the statement describing that the advertising algorithms used by Facebook and Google serve to reach a group with related audiences more accurately than manual targeting. This is followed by 14.5% of participants who somewhat agreed with this idea, compared to 13.2% of members who had no clear position either for or against, 7.92% who said they somewhat disagreed and 3.9% who showed a strongly disagreed position.

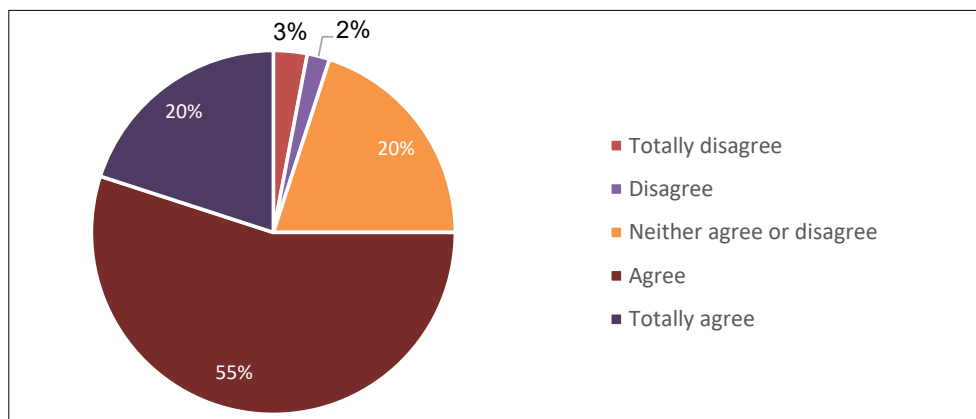
**Chart 6. Facebook and Google ad algorithms are more efficient in detecting creatives improving conversions compared to manual management of the creatives**



Source: prepared by the author

Fifty-one point three percent of respondents somewhat agreed with the statement that Facebook and Google's advertising algorithms are more efficient at detecting creatives and improving conversions compared to manual or traditional creative management. In this regard, 30.3% of the participants fully agreed with this idea, compared to 17.1% who show a more neutralized position, 1.3% with a 100% negative or contrary view with this idea so they consider that algorithms do not improve conversions.

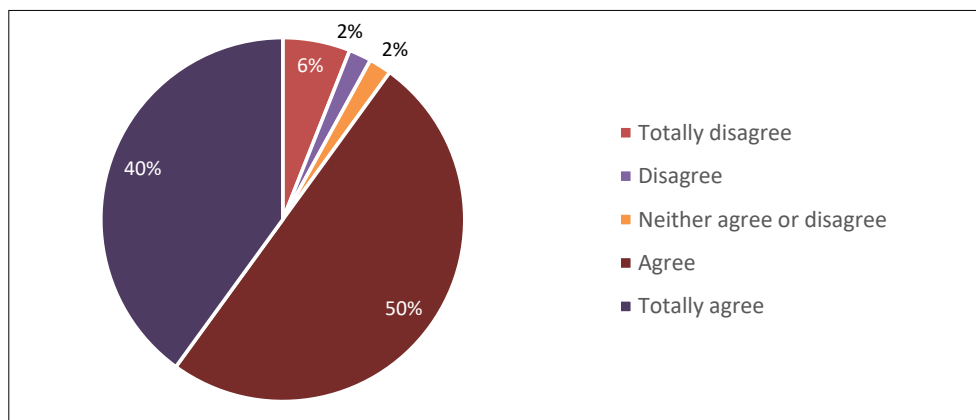
**Chart 7. The future of online and programmatic advertising requires knowledge of Facebook and Google's advertising interfaces**



Source: prepared by the author

Fifty-seven point nine percent of respondents somewhat agreed with the statement in the question, followed by 19.7% who neither agreed nor disagreed, 18.4% who strongly agreed, and a minority of 1.3% and 2.6%, respectively, who disagreed or strongly disagreed.

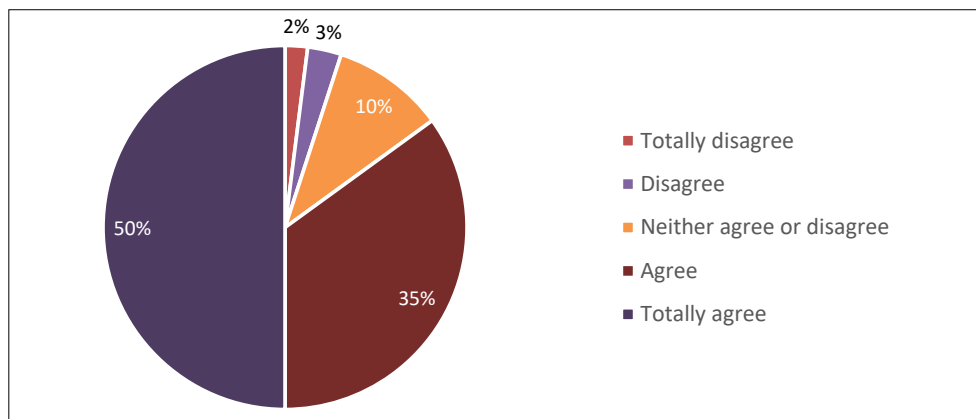
**Chart 8. Digital advertising campaigns increasingly require the use of algorithms and automation offered by Facebook and Google**



Source: prepared by the author

Forty-eight point seven percent of respondents agreed with the statement in question n° 8 that Facebook and Google advertising campaigns increasingly require automation and the inclusion of algorithms. A similar opinion is held by 46% of respondents. A 2.6% of the participants have a neutral position (neither agree nor disagree) and, finally, other amounts expressed in groups who have a contrary position.

**Chart 9. Machine learning evolution will increasingly include actions performed by algorithms as opposed to services provided by human capital**

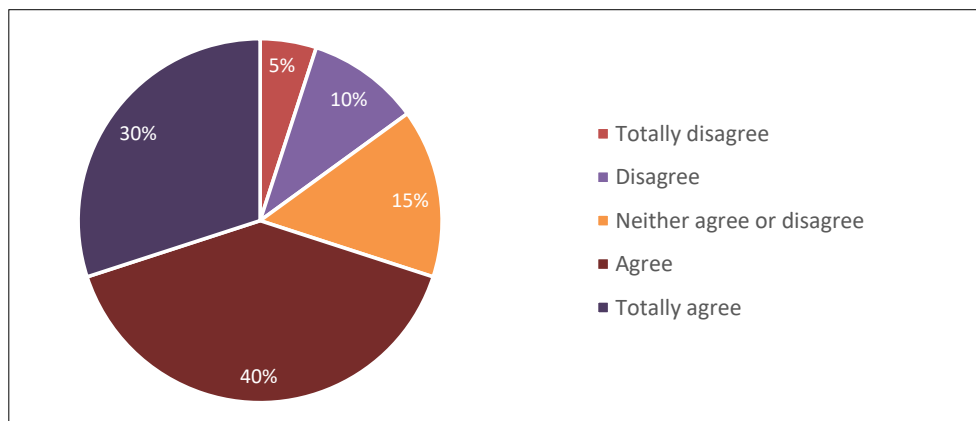


Source: Prepared by the author



This pie chart shows information on machine learning evolution and how this change has resulted in more and more advertising actions being carried out by algorithms and machines supplanting human identity. In this regard, 53.9% of the participants considered that they totally agreed, followed by 39.5% who somewhat agreed, 2.6% who neither agreed nor disagreed, and finally, 3.9% who totally disagreed.

**Chart 10. The handling of big data information is key to understand the proper advertising algorithms functioning**

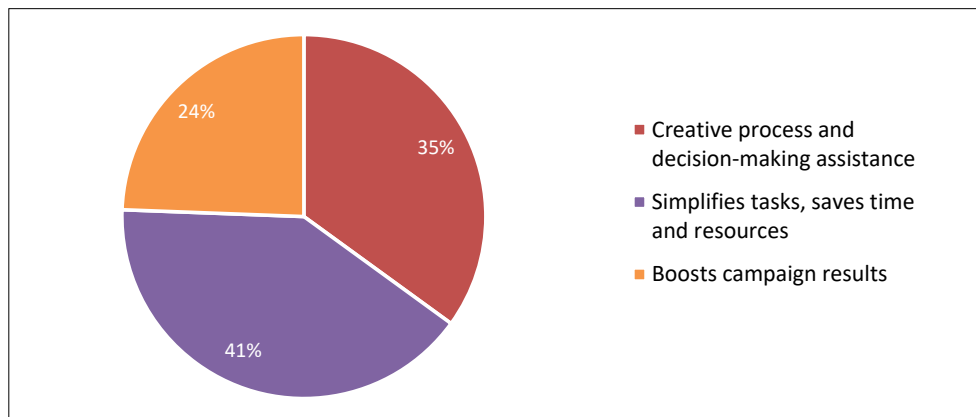


Source: prepared by the author

The survey ends with the tenth question, which asks whether big data information management is so important to understand how advertising algorithms work. Faced with this situation, 40.8% of the participants somewhat agreed, followed by 31.6% who completely agreed, 15.2% who said they neither agreed nor disagreed, 11.8% who expressed some disagreement and 2.6% who totally disagreed.

*Results of the structured interview*

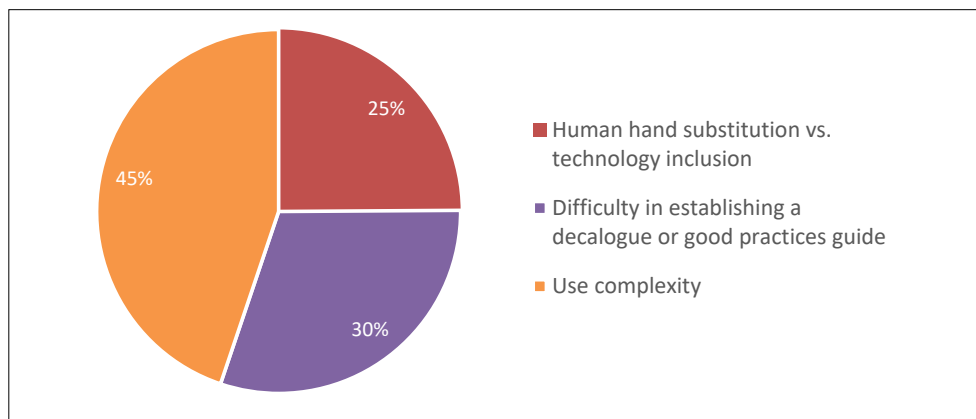
**Chart 11. What are the competitive advantages of including automated functionalities by Facebook and Google?**



Source: Prepared by the author

We can see that 40.60% of respondents consider that among the most obvious competitive advantages of Facebook and Google automated functionalities are task simplification and time and resources savings. This is followed by 35% of respondents, compared to 24.40% who indicate the relevance of boosting campaign results.

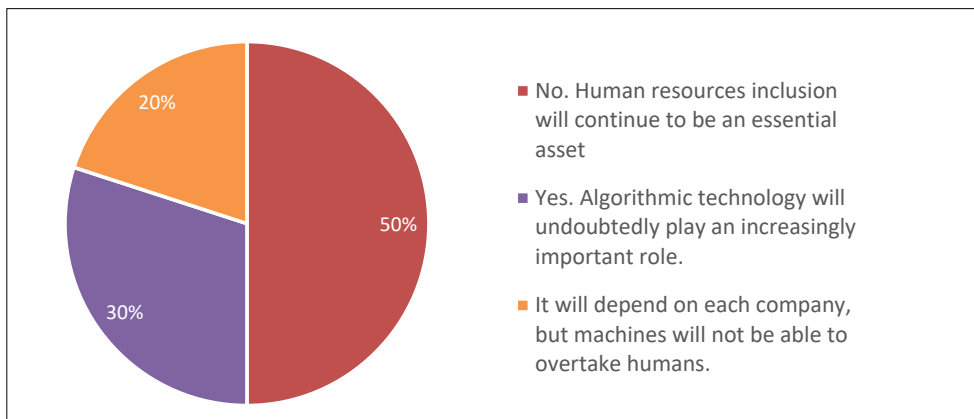
**Chart 12. Which areas generate some distrust regarding advertising algorithms effectiveness?**



Source: Prepared by the author

Forty-five percent of respondents indicated that the complexity involved in algorithm use is one of the aspects that generates some mistrust. After this large percentage, 30.40% of the interviewees point out the absence of a practice guide as one of the most important problems. Finally, 25% of the interviewees point out human hand substitution against technology inclusion.

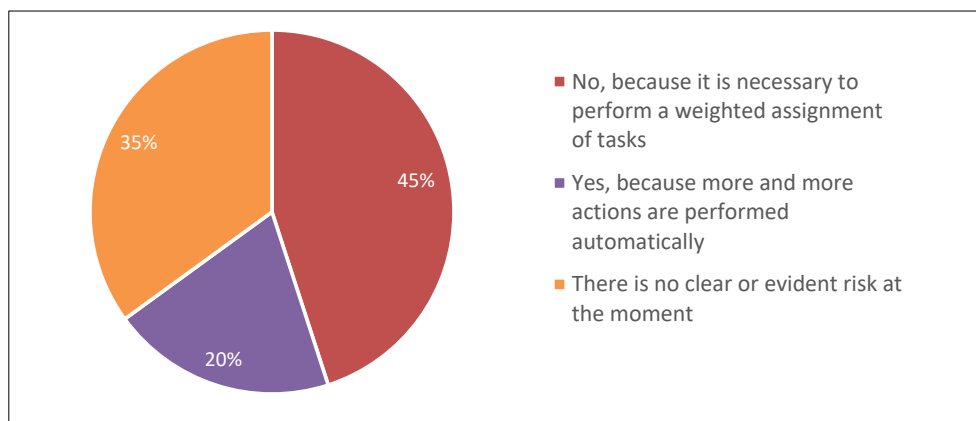
**Chart 13. Do you consider that both machine learning and advertising processes automation will result in the reduced inclusion of specialized personnel in advertising campaign management?**



Source: Prepared by the author

Fifty percent of interviewees did not hesitate to point out that companies will continue to rely on human capital in an active and dynamic way to carry out certain parts or areas of the production processes, compared to 30% who pointed out that the technology of algorithms will increasingly have a greater weight even supplanting or replacing human presence. Finally, 20% said that this reality would ultimately be shaped in accordance to the dynamics present in each company.

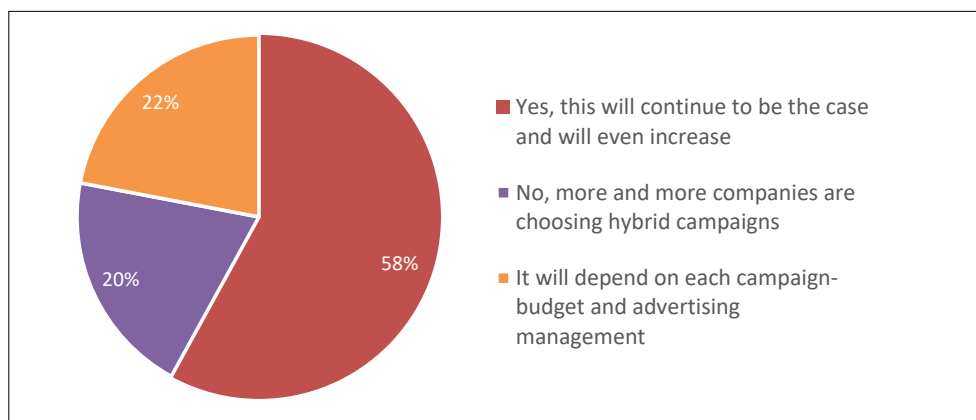
**Chart 14. Is it dangerous or controversial to automate so many functions by including advertising algorithms in platforms like Facebook and Google?**



Source: Prepared by the author

Forty-five percent of those interviewed indicated that there is no danger or risk involved in algorithm presence. In contrast to this group, 35% of experts did not hesitate to affirm that for the moment, there is no clear or evident risk in task automation through advertising algorithms, and finally, 20% indicated the notable presence of a risk or danger related to increased task automation.

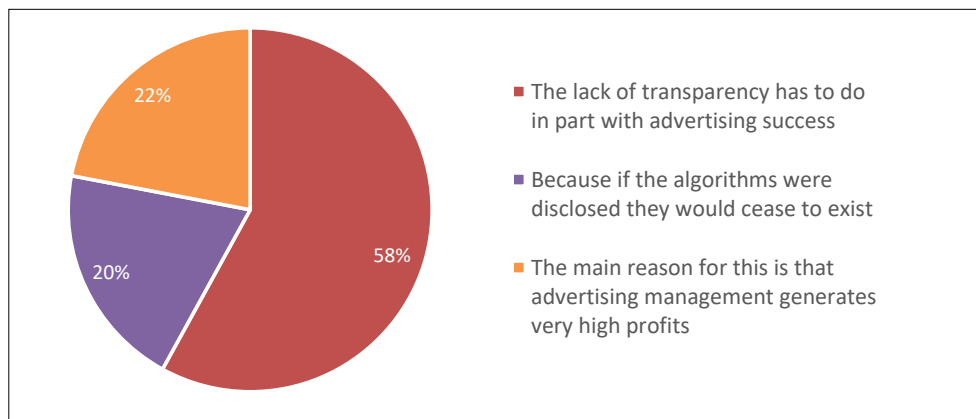
**Chart 15. Do you think that the trend of investing more and more in Facebook and Google advertising will continue in the coming years or will companies return to conventional advertising campaigns?**



Source: Prepared by the author

Fifty-eight percent of respondents indicated that the dynamic of continued investment in Facebook and Google advertising space will continue to grow and even increase. A total of 22% identified unequivocally that investment in digital media depends mainly on each campaign. Finally, 20% of respondents identified a scenario characterized by the presence of a hybrid model, i.e. a situation halfway between online and conventional advertising.

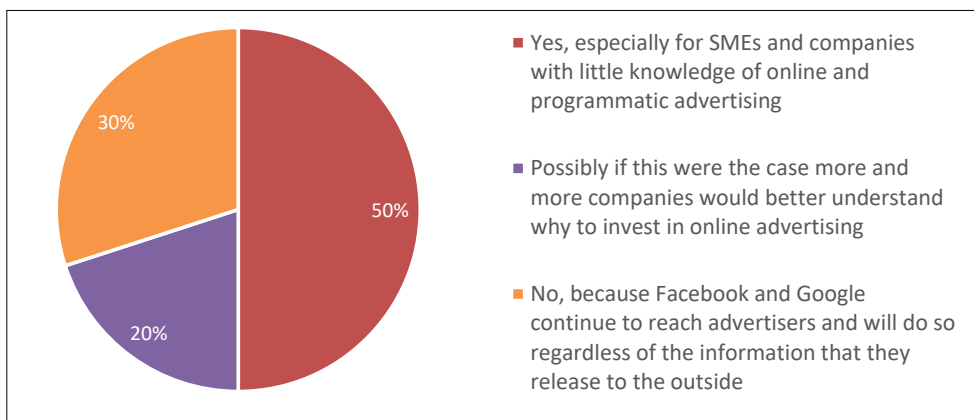
**Chart 16. Being a Facebook and Google partner, why do you think both platforms are so opaque when it comes to how algorithms work?**



**Source: Prepared by the author**

Fifty-eight percent of interviewees considered that the lack of transparency in advertising algorithms management is related to the fact that opacity is the key to these platforms' success. For 22% of those interviewed the main reason for the lack of clarity about how algorithms work is that advertising management generates substantial profits for these companies. Finally, with 20%, a group of respondents who identified other reasons.

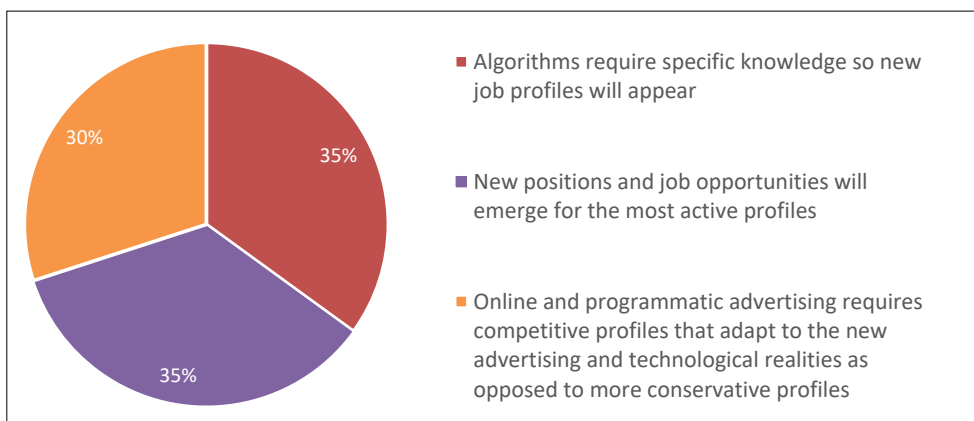
**Chart 17. Could Facebook and Google get more advertisers if they were more transparent about advertising algorithms management?**



Source: prepared by the author

For 50% of the interviewees, if Facebook and Google would disseminate more information about how algorithms work and how useful they are, more and more companies would invest more in online advertising. Some 30% of respondents said that both Facebook and Google would continue to reach out to advertisers. For 20% of respondents, if Facebook and Google platforms were more transparent, more and more companies would probably have a better understanding of how algorithms work.

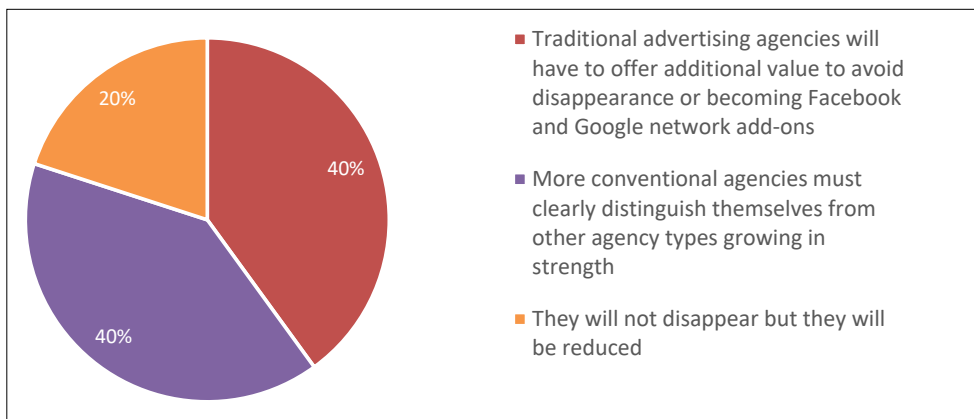
**Chart 18. What characteristics should online and programmatic advertising experts and campaign managers meet?**



Source: Prepared by the author

For 35% of interviewees, algorithms and their knowledge require a series of specific skills that are likely to be common among new professional profiles that may emerge. The same percentage (35%) represented the experts and professionals who indicated with certainty the presence of new profiles in medium and long term. Finally, for 30% of respondents, very competitive professional profiles will appear.

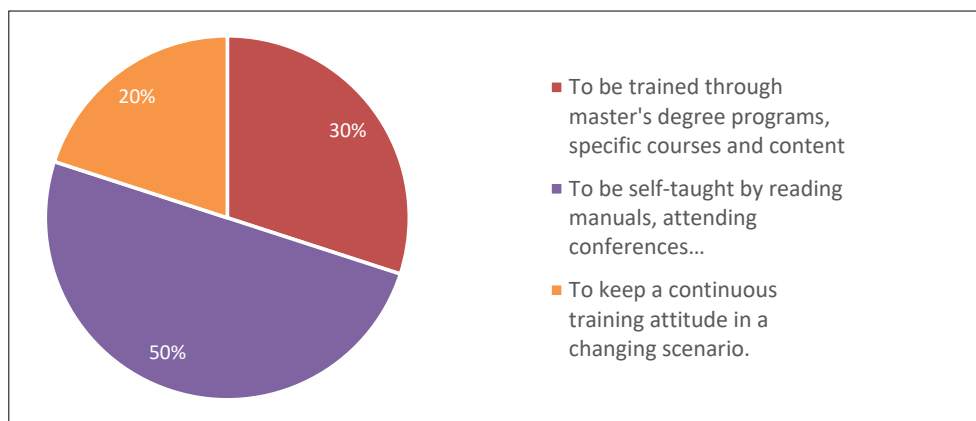
**Chart 19. Could conventional advertising agencies disappear due to online advertising growth and its multiple advantages such as the ability to generate little budget advertising?**



Source: Prepared by the author

For 40% of respondents, traditional advertising agencies will have to offer additional value or a plus to avoid disappearance. Similarly, for 40% of respondents, the more conventional agencies will have to distinguish themselves clearly from Facebook and Google platforms by offering added value that will convince brands

**Chart 20. What would be your recommendation, as an online advertising professional expert, for all profiles specializing in programmatic advertising and advertising algorithms management?**



Source: prepared by the author

For 50% of interviewees, the importance of self-knowledge through a dynamic of self-training, attendance at conferences or the like will be fundamental in terms of creating an expert profile. This is followed by 30% of the interviewees who pointed out training relevance. Finally, 20% of the respondents stressed the importance of continuous training in the face of a convulsive and changing scenario.

## 5. Discussion and Conclusions

After the methodological application, different conclusions have been obtained that need to be analysed and shared in order to verify whether the research objectives and hypotheses have been met, or if, on the contrary, conclusive results have not been achieved.

- Objective 1.-To analyse advertising algorithms management in Facebook ADS and Google AdWords as they are two of the channels or supports that offer advertising most used by companies.

The first research objective is to analyse the advertising algorithms operation of Facebook ADS and Google AdWords, two of the most relevant platforms in online advertising today. This objective has been achieved not only with the methodological section, but also with the bibliographical review of the study object. The survey and interviews with the research participants have been fundamental to describe and analyse the advertising algorithms management. In parallel, research objective 1 could not be understood without the following starting hypothesis 1:

- Hypothesis 1.-Facebook and Google algorithms perform better allocation of advertising campaign budgets compared to manual allocation. The algorithms' predictive capacity and impact are greater than human knowledge.



This starting hypothesis has been validated by taking into consideration the data obtained in the results phase after the surveys and interviews application. For the professionals and experts consulted, the advertising algorithms used on Facebook and Google platforms not only improve budget allocation in terms of campaigns, but also help to achieve better results by impacting audiences.

- Objective 2.- Describe the criteria used by algorithms, in addition to automated functionalities.

The second research objective is to describe the criteria used by algorithms and the automated functionalities present in advertising algorithms. This research objective has not been 100% fulfilled due to the multiplicity, variety and diversity of subjective data that advertising algorithms take into consideration to display a specific result for a specific search made by a user.

We should not forget that algorithms offer personalized content based on the needs, search histories and demands made by Internet users. Therefore, records specialization is key. In relation to objective 2 of the work, hypothesis 2 has been described in the following lines.

- Hypothesis 2. Facebook and Google algorithms allow a higher level of analysis of ads created based on measurement, impact and audience penetration criteria that are difficult to detect by professionals running advertising campaigns. This hypothesis has been confirmed.

Reviewing the results shown in this work, it can be affirmed that advertising algorithms serve to effectively analyse the behaviours that digital audiences generate in social networks, particularly Facebook, and in Google. Thus, it is important to remember that campaigns' segmentation and personalization can be achieved through manual action. However, the results achieved do not reach the same level of personalization and user suitability.

- Objective 3.-To address advertising algorithms differences in terms of budget allocation, ad optimization and audience detection.

The third and final research objective aimed to address the divergences present in advertising algorithms in terms of budget allocation and ad optimization. It can be considered that this objective has been met based on the results obtained and the opinions expressed by the interviewees and respondents in considering that campaigns' optimization is greater when performing an automatic allocation than a manual one. However, budget allocation and audience detection depend too much on the advertisers' features, profile and typology.

Given this, and taking a specific example, it seems logical to understand that a sports retail sector multinational, with a global presence, and a local SME specializing in multiservice provision, will have little or very little overlap in factors like budget choice and new audiences prospecting. However, there is one element in common between the two companies: the need to obtain better campaign results by optimizing ads, regardless of budget, duration or target audience. This leads to the explanation of the starting hypotheses 3 and 4 set out in the following lines.

- Hypothesis 3. Facebook and Google advertising algorithms serve to reach audience groups that are much related to products, brands and services, if compared to the segmentation reached manually.

This hypothesis complements hypothesis number 2, so in both cases hypotheses have been fulfilled, affirming that algorithms are fundamental to achieve better campaign results, results optimization and emotional impact on audiences. This has been confirmed by the data from the methodological application of the study.

- Hypothesis 4. Facebook and Google’s advertising algorithms are one of the keys to these platforms’ success, which do not clearly disclose the operation, information management, data and other elements compiled through the aforementioned algorithms.

Hypothesis 4 has been reaffirmed in the research results phase. It can be particularly seen in the interview breakdown. In this sense, the interviewees confirmed that management complexity, opacity and lack of transparency existing around Facebook and Google’s advertising algorithms constitutes part of the success for both companies.

After describing the fulfilment of the research objectives and hypotheses, it is necessary to add that, according to the results shown, the different respondents and interviewees consider that the future of advertising will include digital actions and strategies such as programmatic advertising or online advertising as transcendental tools to ensure not only advertisers’ success in campaigns, but also to become a reference in today’s society. The various theoretical references consulted in the research describe that online or programmatic advertising is consolidating as an increasingly useful and necessary model both among advertising professionals and among consumers.

On the one hand, it is relevant to highlight that advertising algorithms inclusion by technological platforms like Facebook and Google only draws a new scenario where academic and specific training is essential in terms of algorithm management. This was underlined by the different respondents and interviewees who participated in the research shown and stressed the importance of higher education and self-training for tomorrow’s advertising experts.

Another aspect of great relevance is that, despite the boom and growing importance of algorithms and programmatic advertising in today’s society, these tools will never replace the manual and creative work done by human presence. However, it is not wrong to consider that the inclusion of this type of technology in the realization, management and planning of advertising helps to obtain better benefits, both economic and of consumer impact, in terms of the advertising campaigns design.

On the other hand, an aspect of great relevance highlighted in this research and described both in the theoretical framework and in the academic work results, affects the complexity and lack of transparency in Google and Facebook advertising algorithms. In light of the above, the survey participants have not hesitated to state that a good part of these technological companies’ success derives from the advertising campaigns management through machine learning and artificial intelligence inclusion.

This research work finally provides contrasted information on a study object in continuous change (online advertising and new technologies), with multiple consequences, generating a new social, communicative and creative scenario characterized by strategic decision-making. Therefore, academic works like this one should be carried out in order to contribute to a clear vision of what the advertising profession future will be like.

## 5. Acknowledgements

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