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The utilization of artificial intelligence in online advertising and its perceived effectiveness

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UTILIZATION OF ARTIFICIAL INTELLIGENCE (AI) IN ONLINE ADVERTISING AND ITS PERCEIVED EFFECTIVENESS

A Thesis Submitted by

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To the Department of Journalism and Mass Communication

in partial fulfillment of the requirements for the degree of

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Under the supervision of

Dr. Ahmed Taher

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Words fail me as I share my sincere thoughts and feelings on achieving a milestone in the journey of my master's degree in the American University in Cairo (AUC); my second home where I spent both my undergraduate and post-graduate life-changing moments. The story began two years ago. I decided to resign from my full-time job as a marketing communicator in Orange, once I received an email congratulating me for being accepted in the master's program at Journalism and Mass Communication department with a university fellowship as a support of being their student who graduated with highest honors degree. I decided, by then, to redirect my entire career, mainly focus on my master's degree and pursue working in academia as well as teaching.

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And it goes without saying that"my success can only come from Allah. In Him I trust, and unto Him I return." quran surah Hud [11:88]

Cordially,

Nouran Tahoun

ABSTRACT

This study explores the utilization of Artificial Intelligence in the online advertising process and the impact of using AI each stage in that process with the overall perceived effectiveness. It also provides a better understanding of the magnitude of using AI in the four stages of advertising online: namely consumer insights, ad creation, media planning and buying, and finally ad evaluation. *The Process model of AI utilization in online advertising* is the conceptual model of the study, which is developed from the previous literature. A triangulation methodology is implemented to enhance the credibility of the research study and leads to a more comprehensive understanding of the topic. An online survey is conducted with digital advertisers worldwide from both agency and client-side. Nonrandom sampling (N=60) was implemented to test 5 constructs from the perspective of the respondents. Three in-depth interviews were also conducted before and after the online questionnaire to analyze the findings and results and demonstrate insights intothe five proposed research questions. The findings of the study showed beyond doubt that AI is stepping strongly and progressively in the four stages of the data-based online advertising process. Moreover, it significantly showed that there is a relationship between AI utilization in each stage and the following one. Finally, results indicated that using AI in each advertising stage promotes the perceived effectiveness of the overall online ad process.

Keywords: *Artificial Intelligence, Online advertising, AI advertising, AI in online consumer Insights, AI in Online Ad creation, AI in Online Media Planning and Buying, AI Effectiveness, AI in Online ad Evaluation, Global Survey.*

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Chapter 1: Introduction and Literature Review

1.1 Introduction

Trending technologies have been progressively advancing online advertising in the last decade.

On top of the list is Artificial Intelligence (AI) technologies. "In 2019, the AI market is projected

to grow by 154 percent, and while this pivotal advancement is working its way into industries,

not every field is adapting it in the same way." (Statista,2019) As for digital advertisers, there

has been a direction towards integrating AI across various facets of their online campaigns,

bearing in mind that this direction does not mean AI is taking over or replacing human

capabilities in digital advertising agencies. The online advertising process has become more

data-driven and big data has been updated with billions of hourly online digital touchpoints.

More added consumer content means more online advertising opportunities. "Internet advertising

spending in the United States is predicted to increase by about sixty percent, from 72.5 billion

U.S. dollars in 2016 to about 116 billion U.S. dollars in 2021." (Statista, 2019) Consequently, AI

technologies have been stepped in to reshape the online advertising world by making it easier,

cleverer, and more efficient. AI, by its definition, is a very broad term. However, it incorporates

key pillars to be grasped. AI mainly includes Machine Learning (ML), Deep Learning (DL),

Natural Language Processing (NLP), Natural Language Generation (NLG), and any other

application that qualifiesas AI algorithms.Audience segmentation, boosting ad content quality,

creating large-scale personalized ad content, optimizing real-time bidding processes, and monitoring

campaigns require AI to be managed in "a synchronized, and highly efficient" manner (Liao,

2017). This study attempts to explore the utilization of AI technologies in an online advertising

process that is divided into four main stages: Consumer insights, Ad creation, Media planning and buying, and finally Ad evaluation. This study contributes as well, with its developed *Process Model of AI utilization in online advertising,* with measuring the perceived effectiveness of online campaigns after using AI in each of the former stages. There is a relationship, additionally, between the utilization of AI in each online advertising stage and the next one. This is also tested in this study. An online survey with a sample of 60 global digital advertisers generated highly significant findings thatare briefly concluded in the notion that AI is surely coming to reshape the online advertising process and promote its effectiveness. Due to the paucity of empirical research on this hot topic, this study consequently crosses the disciplinary gap between the advertising field and AI practitioners.

1.2 Literature Review

1.2.1 Deconstructing AI Building Blocks in Digital Advertising

AI is defined as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Kaplan and Haenlein, 2019). AI is quite the buzzword in contemporary time. However, the practical application of some of these technologies may be a little bit vague about its meaning and the breadth of products and applications in which AI plays a role. To make sense of this broad concept, there are certain interconnected terms or building blocks to grasp, allowing advertisers to go deeply into understanding insights covert in user-generated content. This gives rise to the all key "detection of patterns in the data", enabling to foresee future consumers' attitudes and behavior (Kaplan and Haenlein, 2019).

1.2.2 Types of Data: Structured and Unstructured

First of all, to make sense of big data, AI deals with two different types of input data which are "structured data" and "unstructured data." Structured data is "traditional, standardized datasets, such as basic customer demographics, transaction records, or web-browsing history." (Kietzmann et al, 2018) "AI, with its enormous computing power, runs complex computations on large volumes of such structured data and often produces results in real-time" (Kietzmann et al, 2018). As for unstructured data, it is provided "as written texts, speech, and images." Surprisingly, "80 percent of the approximately 2.5 billion gigabytes of daily user-generated data are unstructured" (Rizkallah, 2017). Indeed, AI-based profiles are deduced from "unstructured consumer-generated data" analysis, which can subsequently enrich marketing decisions as well as improve advertising processes in the long-run.

1.2.3 Machine Learning (ML)

Despite being a "new frontier for advertising as a whole", Machine Learning is an inescapable cornerstone for boosting digital advertising, especially that there is plenty of data out there to benefit from in the industry. Juniper Research claims that "machine learning algorithms used to drive efficiency across real-time bidding networks will generate USD 42 billion in annual ad spend by 2021, from USD 3.5 billion in 2016" (Adext,2019).

By definition, "machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns, and make decisions with minimal human intervention" (SAS, 2020). ML is not a new science and indeed its algorithms have been there for a long time. Yet, it gained fresh momentum. Its evolution has come as follows. Due to recent computing technologies, machine learning today differs compared to its past. It was born from "pattern recognition and the theory that computers can learn without being programmed to perform specific tasks" (SAS, 2020). Then, researchers paid attention to AI and tested the ability of ML to automatically apply complex mathematical calculations to big data repeatedly and faster than before. In other words, "the iterative aspect of machine learning" is pivotal because as models are exposed to new data, they are capable to "independently adapt" (SAS,2020). In machine learning language, a target is called a label, whereas in statistics, it is called a dependent variable. SAS, by itself, is an AI tool. IDC ranks SAS as a "leader in 2018 revenue for AI software, growing more than 3x faster than the overall market."

Machine learning allows advertisers to essentially replicate the brain of an experienced buyer as software to make the same optimizations a buyer would. Additionally, the system learns over time and generates more precise results as it works with new campaigns, making correlations

that can be tough for the human brain to detect. The more "unstructured data" an AI system processes, the smarter it gets and the more "fine-grained" its results are for advertisers. In other words, "by detecting patterns in the data, AI systems can reason and propose the best options for the consumer's stated needs more efficiently than humans can" (Kietzmann et al, 2018). AI systems remember all sets of data it has previously computed by storing its memories in a knowledge base and using machine learning to learn from its previous data and problem-solving experiences" (Kietzmann et al, 2018). In the digital arena, think of online recommendation offers such as those from Amazon and Netflix. These are some machine learning applications for everyday life. A prominent example of ML tool used in digital advertising is Adext AI. It is worth mentioning that it won Ewards 2019 as one of the Top 50 AI companies and Intercon Prize as the Best Big Data Project 2019 According to its website, "A Dynamic Audience Optimization Platform to find the best audiences for your campaigns, identifying the lowest KPI cost." "Dynamic Audiences" depends on interactions users have had with the brand's products or websites, but they are hourly changing. That is the reason for the usefulness of Adext as the advertiser does not have the same results with the same audiences. As mentioned above "iterates" is a keyword in the ML area. Accordingly, Adext "iterates" with different combinations of demographics and type of device to define the best performing audiences and efficiently assigning more budget to the top performers in the target audience.

It seeks to find the best target audience for any digital ad, it implements it by smartly setting budgets "every hour for up to 10 distinct demographic segments, using Machine Learning models that utilize Bayesian inference, simulations and Transfer Learning." (Google, YouTube, Instagram & Facebook Ads Artificial Intelligence (AI) Automation Technology, 2020)

1.2.4 Deep Learning

Deep learning is a type of machine learning that trains a computer to perform humanized tasks like speech and image recognition, describe the content, detect objects, and forecast. Deep learning sets up "basic parameters about the data and trains the computer to learn on its own by recognizing patterns using many layers of processing" (SAS, 2020), instead of organizing data to run through predefined algorithms and equations. Deep learning depends on huge "neural networks with multiple layers of processing units" to learn complex patterns in large amounts of data. Simply speaking, a neural network is a type of machine learning inspired by the workings of the human brain. "It's a computing system made up of interconnected units (like neurons) that processes information by responding to external inputs, relaying information between each unit" (SAS,2020). Consequently, deep learning depends on these neural networks through which it requires diversified passes at the data to reach connections and derive meaning from undefined data.

In the discussion of digital advertising, there are non-stop and timely streaming data from various digital media channels to build those neural networks with many deep layers. One of the practical applications of deep learning is speech recognition such as "Skype, Google Now, Apple's Siri", and others. Additionally, as mentioned in machine learning, various digital channels such as Amazon, Youtube and Netflix have popularized the idea of a "recommendation system" with a high chance of knowing what the consumer might be interested in next, based on past behavior. Subsequently, deep learning can be employed to improve recommendations in complicated environments such as music interests or clothing preferences across multiple platforms. In the digital era, it is worth mentioning that even the interfaces of devices have

evolved enormously as well. In other words, the mouse and the keyboard, for example, are being replaced with gestures, swipe, touch and natural language, showing more interest in AI and deep learning.

1.2.5 Natural Language Processing and Generation (NLP and NLG)

Natural language processing (NLP) allows "AI systems to analyze the nuances of human language to derive meaning from various sources as blog entries; product reviews; and the billions of daily Tweets, Facebook posts, and status updates" (Kietzmann et al, 2018). Advertisers can use various techniques of NLP, along with other AI elements such as machine learning and deep learning, for analyzing, building and generating advertising content. NLP is a key element in the discussion on AI and digital advertising as it does not only resolve obscurity in language, that may occur due to variations in human expression verbally and in writing, but also NLP adds useful "numeric structure to the data for many applications, such as speech recognition or text analytics" (SAS,2020).

There are various techniques of NLP to make sense of big data, in particular the unstructured human language. Generally, NLP breaks down that complex human speech and text into shorter and elemental pieces and find out how those pieces work together to create a valuable meaning. NLP is capable of content categorization which means "a linguistic-based document summary, including search and indexing, content alerts and duplication detection" (SAS, 2020). Besides, not only NLP can precisely capture the meaning and themes in unstructured text collections and pull it to structured information, but also it does sentimental analysis by identifying the mood and subjective opinions with a large array of unstructured data. This sentimental analysis can be connected to the discussion of emotional intelligence and the humanizing of technology that is

tackled later in this paper. Finally, document summarization and automatic translation of text or speech are main tasks eased by NLP.

A subfield of NLP called natural language understanding (NLU) has started to be popular. NLU algorithms go beyond the "structural understanding of language" to tackle the extremely complex problem of "semantic interpretation" which is, grasping the "intended meaning of spoken or written language, with all the subtleties, context and inferences that we humans can comprehend" (SAS,2020).

1.2.6 Image Recognition and Generation

As a result of Machine learning and Deep Learning, image recognition comes to help advertisers grasp and analyze visual content that people share on digital channels such as social media which reveal genuine user' behavior. For example, "Selfies" show brands used and consumers' personal details. "Consumers identify details about the offerings portrayed in the image, and advertisers benefit from contextual consumption details" (Forsyth and Ponce, 2011).

1.2.7 Speech Recognition

Speech recognition is a technology that allows AI, through Machine Learning and Deep Learning, to detect and analyze the meaning of spoken words and can be converted to text. Various companies and brands utilize this AI technology to understand their consumers and boost their service performance. Consequently, AI voice recognition has recently become a standard for products and services that have to do with technology. "Research markets reported that the speech recognition market will be worth $18 billion by 2023" (Jesus, 2019).

1.2.8 Big Data in Advertising

Big data, particularly, functions as the "basic driver of artificial intelligence", that has been deemed as "the core technology of the fourth industrial revolution" (Chen and Zhou 2018). The concept of big data gained popularity in the early 2000s when industry analyst Doug Laney articulated the now-mainstream definition. "Big data is often defined by the '3 Vs' (Laney, 2001) of large volumes of data generated at a high velocity from a variety of sources." Sivarajah et al. (2017) summarize and discuss an expanded "list of Vs, adding veracity, variability, visualization, and value." Hofacker, Malthouse, and Sultan (2016) explains adds "volatile" to the list of Vs. It is worth mentioning that Machine Learning and Deep Learning craves big data because it is crucial to isolate hidden patterns in the given data and to reach out to answers. With deep learning, the finer quality big data the advertiser has, the better the decisions and results.

There is variability in Big Data sources. Speaking digitally, social media data arises from consumers' interactions on Facebook, YouTube, Instagram, and other social media platforms. They comprise a large volume of unstructured data in the form of images, videos, voice, text, and sound which are deemed to be useful for marketing, advertising, and sales.

"Big Data chronicles the Past"(Edward C. Malthouse & Hairong Li, 2017). In other words, big data derived from digital advertising are essentially a "detailed record of what customers did in the past." Data derived are both structured and unstructured. Big data's main reason for advertising is the "digital brand touchpoints". Touchpoints here means "any contact between a (potential) customer and a brand, before, during, or after purchasing it" (Edward C.

Malthouse & Hairong Li, 2017). Digital touchpoints are symbolized in the online arena such as social media networks, and mobiles. These digitized touchpoints can be recorded over time, for billions of users, and hence create big data sets. On the contrary, traditional "offline touchpoints", such as being exposed to a print ad, were (and are) hard to monitor and record consumers' behavior. Thus, the main focus here in this study is digitized advertising where big data and AI technology play meaningful roles. Today's top digital companies, such as Google, Facebook, Amazon, and Netflix, have been obtaining big data from their users' digital attitude.

Big Data plays pivotal general roles in advertising research. First, it can burnish existing advertising theories with the aid of new data sources. Second, big data can "optimize the delivery of ad messages by improving advertising decisions, such as whether to show some customers an ad at all, which message to display (personalization) and how much to pay for exposure" (Edward C. Malthouse & Hairong Li, 2017).

Big data is usually kept in databases. Advertisers should gain, as a starting step, "the knowledge of relational databases and structured query language (SQL)" to be capable of analyzing and using big data sets. "Many other types of databases are used to store specific types of big data (e.g., Hadoop), and knowing about them is especially important for the execution of ad messages" (Edward C. Malthouse & Hairong Li, 2017). Advertising Research with big data looks like "assembling a jigsaw puzzle." Each consumer's data set recorded in any online platform has some essential information. However, key variables are usually missing and must be imported from other big data sets. In other words, each data set is a single piece and the stitching of pieces gives a "complete picture of the customer relationship" (Edward C. Malthouse

& Hairong Li, 2017). However, it is worth mentioning that there will always be missing pieces of information that constitutes a "limitation for using big data in advertising research." Take social media data as an example. This data may record a consumer's thoughts about a brand but do not possess information on the consumer's actual purchases. Prices offered, promotions, and marketing mix data about competitors, will be in other data sets. The same goes for the contextual informational data, such as who accompanies the consumer at the time of purchase and many other data items, come from other data sets.

Using big data has itspitfalls. The literature on this point can be summarized into 4 generic limitations. First, validity is one of the big data limitations whereadvertising research may be impressed by the giant data sets and override crucial concepts like reliability, internal and external validity, and sample design. Samples driven from Big data are mostly convenience samples. True, it may be an exhaustive coverage of the population (census). However, it may not represent the target audience of an advertising research purpose. Second, fraud can be a pitfall through "non-human traffic." Click fraud has many variations such as "click farms" where "low-paid workers are hired to click on paid advertising links or like brands" (Edward C. Malthouse & Hairong Li, 2017). One motivation for creating bots is "pay-per-click pricing systems, which create an incentive to inflate clicks." Third, data quality must be checked. Advertisers shouldn't assume that data is error-free. They must exert substantial effort to obtain data that can be used in their analysis, pre and post their campaigns. Fourth, privacy and trust constitute another key limitation as well. In many digital campaigns, advertisers communicate with their consumers with highly targeted and personalized offers. In this scenario, big data can enrich advertisers with sensitive and personal consumer "digital touchpoints." This may sound super beneficial. However, it has its disadvantages as it may trigger the "awkward sense that a brand has violated

the consumer's privacy." As a rule of thumb, "trust between the customer and brand is a critical

factor, where a personalized message from a trusted brand is appreciated by the customer, but a

similar personalized message from one that is not trusted causes complaints to government

regulators and/or the media" (Edward C. Malthouse & Hairong Li, 2017).

1.2.9 Emotional Artificial Intelligence and Media Analytics

In the discussion on AI and its tools such as neural network, machine learning, and deep

learning, the focus is on the human brain as it is the utmost effective tool for problem-solving.

Yet, until very recently, there is a key part of the puzzle that has been disregarded in human

intelligence which is emotional intelligence. A great deal of valuable big data that communicates

the consumers' emotional state is lost if machines cannot read our expressions, gestures, speech

patterns, tone of voice, or body language. Thus, practitioners in advertising and market

researchers know the value of their consumers' emotions and their impact on their behavior

towards their brands. Grasping consumer emotional engagement with ads content and

experiences is essential to creating the top-notch integrated marketing communication campaigns

and optimizing media spend. Collecting quality emotion data is pivotal as it indicates "key

success metrics such as brand recall, sales lift, purchase intent and likelihood to share" (Affectiva

Media Analytics, 2020). Consequently, the global leading emotion-focused AI developer,

Affectiva emerged in 2009 as a technology provider to the marketing and content industry.

Affectiva team provides valuable data using AI and deep learning to understand consumer

emotional engagements in various industries. One of its solutions is Media Analytics. Affectiva

co-founder and CEO Rana el Kalioubi said to Forbes that "Only seven per-cent is in the actual

choice of words you're saying, so if you think about it like that, in the existing sentiment analysis market which looks at keywords and works out which specific words are being used on Twitter, you're only capturing 7% of how humans communicate emotion, and the rest is basically lost in cyberspace" (Marr, 2018). Consequently, Affectiva uses, as commonly used in the marketing industry, "facial coding" to provide deep insights into "unfiltered and unbiased consumer emotional responses to brand content" (Affectiva Media Analytics). As consumers watch the ad stimulus, Affectiva emotion AI measures their moment-by-moment facial emotional expressions. The results are analyzed and displayed in an easy to use dashboard. Graham Page, Managing Director of Offer and Innovation, Kantar Millward Brown says that "Facial coding is a powerful way to understand consumers' unfiltered responses, and Affectiva's market-leading solution enables us to understand a wide range of emotional responses to marketing content" (Affectiva Media Analytics).

As mentioned above, Affectiva's media analytic solution aids advertisers and brands to predict key success metrics such as "brand recall, sales lift, purchase intent, and virality." These metrics indicate benchmarks of the ad's performance compared to competitors by "geography, product category, media length, and on repeat view." Uniquely, these metrics are built on the global largest emotion database of "40,000 ads and more than 7.7 million faces analyzed in 87 countries" (Affectiva Media Analytics, 2020). A Quarter of the Fortune Global 500, including 1,400 brands like Mars, Kellogg's, and CBS, use Affectiva Media Analytics solution to optimize ad content and media planning and buying.

Using AI emotion by Affectiva can improve the story flow for the creative team in the advertising field.Moment-by-moment emotion data can define viewer confusion and lack of engagement. This insight aids in improving the "story arch" of an ad. Moreover, it helps in identifying the most emotionally engaged moments in long TV ads. Consequently, in the ad creation phase, the creative can retain the most impactful parts when cutting down to shorter online ads. Furthermore, advertisers can use AI emotion data to know if the ad viewers are emotionally engaged at the moment the brand is revealed in an ad and test the effectiveness of taglines and voice-overs. Last but not least, applying emotion AI is essential in media planning and buying help intesting final ads for emotional engagement to pinpoint potential wear out. Effective advertisers can direct their dollars with the best emotional impact on repeat views.

1.2.10 Digital Advertising

It is also known as "online advertising" or "internet advertising which substantially means the usage of the online platforms to communicate advertising messages to consumers. In other words, digital advertising can be broadly defined as all "brand-initiated communication with the intent to have an impact on people" that happens through various digital media channels (Dahlen & Rosengren, 2016). Myriad new digital advertising formats have emerged that enable practitioners in this field to communicate the tailored messages at the "right place" to the "right target audience."

It is worth mentioning that "U.S. digital advertising revenues reached $57.9 billion during the first six months of 2019, which is the highest spend in history for the first half of the year," according to the latest IAB Internet Advertising Revenue Report released by IAB and prepared by PwC US. "The record-breaking total marks a 17 percent year-over-year increase from the first half of 2018" (IAB,2019). "With a market volume of US$116,995m in 2019, most ad spending is generated in the United States" (Statista,2019).In some countries, including "UK, China, Norway, and Canada, digital has already become the dominant ad medium" (Emarketer,2019).

Since its onset in 1994, digital advertising has been steadily innovated upon. Today the digital advertising landscape consists of various ad formats. This section tackles the pillars of digital advertising.

1.2.11 Digital Advertising Main Formats

Generally, traditional advertising follows the mass "spray and pray" method, where an ad runs over a platform with fundamental reach with the hope that a few viewers may positively react to what they see, hear, or read. In the non-digital scenario, the ROI cannot largely be determined. On the contrary, Digital advertising is "heavily data-driven" and can empower the advertiser with detailed insights into the campaigns and their results. Linking this discourse with the AI scope, the availability of user AI big data, and "rich targeting capabilities" makes digital advertising a vital tool for advertisers to reach their audience.

Digital advertising takes various formats to achieve its targets and objectives. Generally speaking, there are three mutually exclusive broad categories of digital ads format, text, banner, and video. In the book *Digital Advertising: Theory and Research,* Rodgers and other authors (2017) explains the main 7 key digital ads types that can be dragged under any of the former main ad formats categories. The 7 key digital ad types are "Search Engine Advertising, Banner advertising, Advergames, Video advertisement, Mobile Advertising, Social media advertising", and last but not least the "Native advertising". Those trends are driven from a content analysis that reviews one of the advertising industry's top publications. This content analysis was done by Rodgers et al to show the evolution of interactive advertising in the industry from 2000 to 2015.

1) **Search Advertising**

It is named as Search Engine Marketing (SEM). When the consumer searches for something on search engines like Google or Bing, a few search results with the tag 'Ad' appear at the top of the Search Engine Results Page (SERP). These ads are the consequence of search engine advertising. While this swiftly became a well-known option for advertisers for its

efficiency, it was criticized due to the lack of "rich media support". The "earliest" and most notable company to use and apply search advertising was Google. One of the earliest ethical concerns in this digital ad format was its inability to differentiate between what was "paid" and "unpaid content". SEM is plausibly the most commonly used ad format. In SEM, advertisers bid on keywords along with their competitors to appear at the top of the page. SEM ads can either be Pay Per Click (PPC) which means pay every time someone clicks on your ad or Cost Per Mille (CPM) which means pay for every 1000 impressions on your ad, nevertheless of the clicks.

By 2004, "search advertising was a $2.6 billion market with the biggest players being Google and Yahoo! search engines" (Rodgers et al,2017). With the progress of video advertising, the "video search" was deemed to be a path in which search could boost beyond just text. By 2007, with the advent of mobile devices, not only Digital Conglomerates, like Google, Yahoo!, and Microsoft, declared mobile search products, but also social media had joined the track, with "Facebook announcing a social graph search that had, to that point, received mixed reviews". (Rodgers et al, 2017)

As the ad contents available on digital networks grew, the importance of search increased, and brands sought to explore tracks to "monetize" this digital innovation. "In 2000, Google started to monetize search using a CPM model, where it allowed advertisers to display ads based on keyword searches, which eventually evolved into Google AdWords, where advertisers on average spent $1 for every $2 of revenue they earned" (Gabbert, 2012).

2) Banner Advertising

Although banner advertising was one of the main formats of digital advertising earlier, it soon had to adapt as "rich media" turned out marketable because it allowed users to click, drag, scroll, and interact in various ways. The Flash technology, greater interactivity, and less static graphics were perceived to result in the decline of "regular banner ads." Additionally, as metrics evolved, it was thought that CTR was not a strong measure, as "awareness" was thought to be a more essential metric that "could not be measured by clicks alone." Banner ads are still implemented and cautiously "cultivated" for efficient use in campaigns. For example, "Samsung's 2008 Olympic gold medal treasure hunt" campaign had online users to search for "clues in various digitized channels like emails, banner ads, and others to have a chance to win prizes."

3) Social Media Ads

In the current era, advertisers know the power of social media and the huge opportunity created by it, as most of the audience spends a great deal of time on social media platforms. Social networking sites (SNSs) such as Facebook, Twitter, YouTube, Instagram, LinkedIn, Reddit, and others were developed in 2003. Social media ads can aid advertisers in building a community for brands, producing leads, increasing event attendees, and "boosting website conversions, app installations, and growing footfalls to your retail store." (Rodgers et al, 2017). In 2008, social media campaigns became widely popular and more effective than advertising in traditional media (e.g.,TV, newspapers, magazines, and radio). "One of the reasons for using social media for advertising was that opinions generated by peers were thought to be the most influential form of recommendations" (Hanlon, 2008).

To engage with their consumers, such social media campaigns paved the way for advertisers to build communities with their target audience and particularly their loyal consumers who would

spread positive Word Of Mouth (WOM) by recommending the brand online. Additionally, social media advertising was deemed to be efficient in communicating with "hard-to-reach" groups that may not get exposed to most ads but could be reached through their peers. "In 2009, there were plans to develop a brand social score, a social media metric that provided a magnitude score (e.g., 0– 10) indicating the level of chatting about your brand in a given week, which shared traits of the then-popular Net Promoter Score but was easier to understand" (Klaassen, 2009).

4) Native Advertising

Native advertising started gaining popularity in 2012. They can appear on social media sites or other online pages, and they don't look like typical ads. They appear under 'Recommended Reading', 'Related Stories', or 'Promoted Stories' that visually match the content the consumer read. Upon clicking, the consumer is redirected to the advertiser's website. Much like advertorials in print, native advertising applies similar principles for online advertising. "Websites started featuring sponsored content disguised in the form of editorials or sponsored created content." (Rodgers et al, 2019) Indeed, there ethical issues concerning the ad used in terms of figuring out what content is "editorial" and what content is "sponsored". Consequently, social media has adopted similar styles of native ads due to its assumed effectiveness (Rodgers et al, 2019).

5) Mobile Advertising

IAB's internet advertising revenue report for the year 2018 states that "Advertising delivered on a mobile device now makes up 65.1% of total internet advertising revenues".

In its early days, "it was thought that mobile marketing was not a strategy in itself but was part of the media mix" (Cuneo, 2003). That was due to the challenges faced by advertisers "with the

technological affordances of mobile devices in 2005." Mobiles, at that time, typically had smaller screen sizes and "limited bandwidth." Later on, mobile applications became widely adopted, with each app serving a mutually exclusive purpose. As a medium for digital advertising, mobile was continually growing, particularly alongside the growth of video streaming and social media usage. Rodgers and other scholars named "mobile 'third screen', indicating thetime users spend on their phones just like they would on television and computers" (Rodgers et al, 2017). The advances of mobile applications and "digital browsing" offerednew tracks in which advertising was communicated to online consumers. Today, mobile advertising, as a subset of mobile marketing, can be shown via text messages, embedded in mobile apps, or occur in social media or news sites or smartphone searches. Mobile technology used by companies such as Google and Facebook caters to mobile advertisements based on a consumer's web browsing history, geographic location, and data collected by shopping habits.

"As mobile devices outnumber television sets now by almost 3 to 1, the chances of a potential customer seeing a mobile ad are greater than that of most other forms of advertising today"(Kenton, 2020). One of the popular models in mobile advertising is known as cost per install (CPI), "where payment is based on the user installing an app on their mobile device. CPI mobile advertising networks work either as incent or non-incent. In the incent model, the user is given virtual points or rewards to install the game or app.

"Mobile ad placement works by way of a programmatic bidding process for ad placement, in which advertisers bid in real-time for the right to place an ad on a mobile device" (Kenton, 2020). This bidding process mainly depends on a process which is known as a demand-side platform (DSP), that the paper tackles extensively below in the Media planning and buying section.

Mobile advertising has lots of benefits. First, The accessibility of mobile advertising ensures that ad campaigns get delivered instantly and accessed easily by the target audience. Second, geotargeting is another benefit of mobile advertising. Because people keep their mobiles most of the time with them, advertisers can make use of the consumer insights to deliver location-based, geo-targeted advertisements based on user's psychographics, and behavioral habits. For example, some mobile ads may be displayed only when a mobile user is close to a certain brand shop or service provider. Third, the overall cost of designing a mobile advertising campaign is super efficient and less than an Above The Line (ATL) advertising. Fourth, mobile advertising allows the advertisers to create more personalized campaigns as a result of its benefit of geo-targeting and accessibility. Fifth, mobile advertising has higher conversion rates because "smartphone-based ads, clicks, spend and conversions report the highest growth rate when compared to desktops or even tablets" (Kenton, 2020).

6) Video Advertising

Video advertising has constantly grown and currently a pillar in online advertising. Initially, online video ads were structured similarly to television spots. However, creative executives and advertisers recognized that the online environment should be a part of the traditional channels. Consequently, unique video clips with special dimensions needed to be created.

With the onset of sharing on social media, advertisers have aimed to reach "viral status" with their campaign-able messages. At the time, "the number of views thought to indicate campaign success was 'one million'" (Cutler, 2009). Subsequently, "advertisers employed metrics to analyze how the videos were received and shared" (Rodgers et al, 2017). However, advertisers had recognized that even though a campaign may have gone viral, it might not mean commercial

success as long as it did not guarantee to gain viewers as actual consumers. A new Facebook study revealed that "people spend 5 times longer watching video content than reading static content" (Brouwer, B.,2018).

"As video advertising became more popular, advertisers had started to create theirspots, with the belief that brands should not rent entertainment but should own it" (Hampp, 2008). The hit of video advertising had led to YouTube selling video ad space on real-time exchange. "Facebook, as well, launched its video ads and noticed a 360 percent increase in video news feeds in 2014" (Rodgers et al, 2017).

According to Interactive Advertising Bureau (IAB) guidelines, there are three types of video ad formats."A) Linear video ads: the ads are presented before, in the middle of, or after the video content is consumed by the user, in very much the same way a TV commercial can play before, during, or after the chosen program. B) Non-linear video ads which run concurrently with the video content, so the users see the ad while viewing the content. C) Companion ads: commonly text, display ads, or skins that wrap around the video experience." In other words, video ads can be generally classified as follows. In-stream videos (Linear Video ads) pop up before, during, or after you view another video content online. As for the Out-stream videos, they show up randomly placed on regular websites like blogs or news pages. As for interactive videos, they appear in a full-screen format and appear to take over the device screen. Webpage videos are another type of video ad that gives viewers additional information about a service, or product. Finally, in-game videos are a type of online video ads that appear while a consumer is using a mobile application or playing a mobile game. To win the video ad war, more companies competed with shorter ads. "Snapchat limits ads to a max of 10 seconds, and also Facebook recommends video ads to be 15 seconds or shorter" (Anthony et al, 2020). IAB released great

research and discovered that "10-second videos can help maximize impact among Millennials, who are particularly sensitive to mobile ad clutter." Mobile video ads for this audience should be well-targeted, relevant and enjoyable to help maximize its potential impact.

An upside of shorter ads is that they allow more ab testing: it's much easier to create four versions of a 10-second ad, than four versions of a 30-second ad, give the same budget and timeframe. "Video ads have the highest click-through rate (CTR) of all digital ad formats" (Shukairy,2018).

7) Remarketing Advertising

According to Google ads website, remarketing is a digital ad format that allows the advertiser/ brands to tailor their "display ads campaign" for people who have previously visited their site, and personalize their ads "using dynamic remarketing" to these visitors when they do an online search using various apps. In other words, it is a way to reach people who previously interacted with your website or mobile app. It permits the advertiser to "strategically position ads" in front of these audiences as they browse., subsequently helping the advertiser to increase brand awareness or remind those audiences to make a purchase. This technique is also known as retargeting. In reality, remarketing uses cookies to follow the consumers on the web. Not only Google does offer that feature, but also almost every key social media platform and search engine so. Re-marketing has lots of benefits and can constitute a strategic component of the advertising, whether you're looking to boost sales activity, increase registrations, or promote awareness of your brand.

Table 1: Digital Ad Formats

Text	Banner	Video
SEO ads	SEO ads	SEO ads
Social Media ads	Social Media ads	Social Media ads
Native (i.e; News articles)	Native (Instagram)	Native (Youtube)
Mobile ads	Mobile ads	Mobile ads

After explaining each type of prominent digital ads formats, this paper contributes with a generic table suggesting placing the 7 ads formats into the three mutually exclusive digital ad types. However, as for the remarketing ads, it is more of a digital marketing strategy and not a type of ad. Thus, it is excluded from the table above.

1.2.12 Advertising Technology
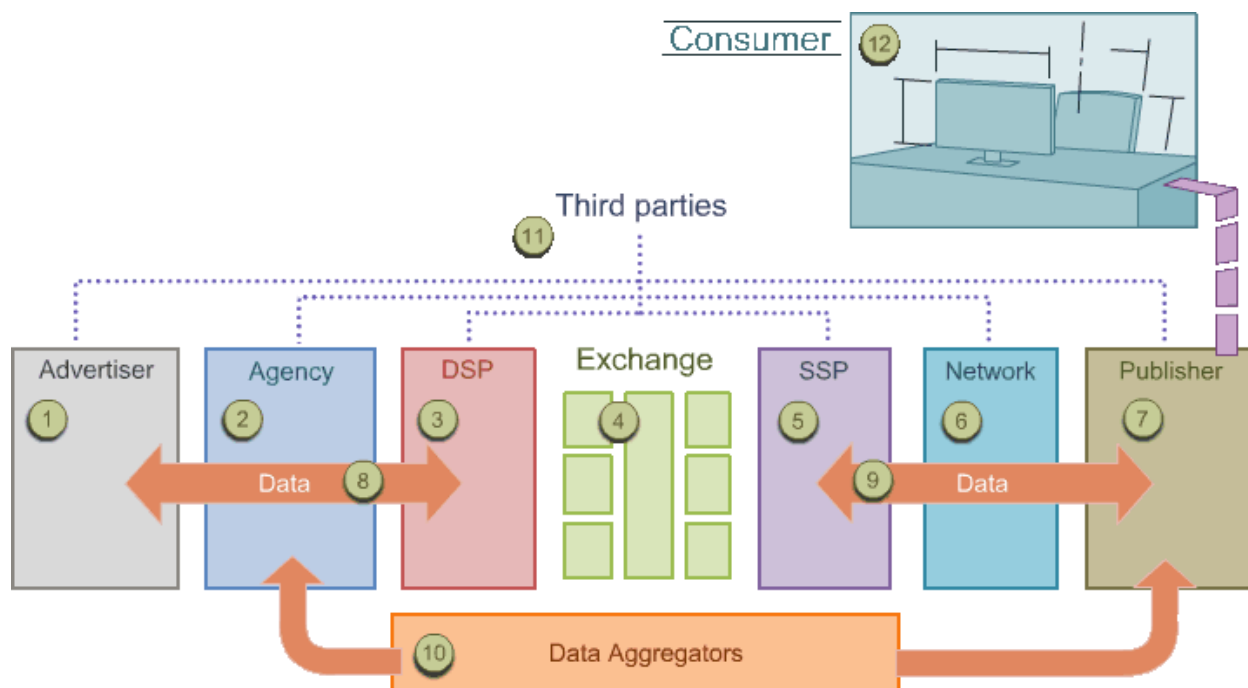
Figure 1: Ad Tech Ecosystem "Source: Monetizmore Website from an article title The Future of Ad Tech Platforms"

In the digital advertising arena, Advertising technology (AdTech) is a term that has been used frequently. In the advertising ecosystem, there are two key entities: the advertiser and the publisher. Advertisers' main objective is to create and manage ad campaigns, target them to the right audience and track ad spend, optimizing the bidding process, and evaluating the results. As for the publishers, who are the entities who own an online platform or the place where ads are shown or served, constitutes the digital equivalent of the traditional media. In other words, publishers provide the space for advertisements to be communicated, manage the ad inventory of various advertisers, gather data of the ad campaign and make sure that there is positive users' experience during the entire process.

This process is super dynamic and takes place in real-time. Thus, advertisers need a system that functions flawlessly when it serves both parties, advertisers, and publishers. Here comes the importance of AdTech. It consists of tools and software that facilitate the programmatic buying and selling of ads. 'Programmatic' is the automated system by which billions of ads can be served, in real-time, to billions of internet users across millions of websites. Additionally, the users' clicks and responses can be tracked and evaluated and reported to the advertiser in nearreal-time. Generally, the AdTech ecosystem consists of ad servers, Supply-Side Platforms (SSP), Demand-Side Platforms (DSP), Data Management Platforms (DMP), ad exchanges, ad networks, analytics, and data suppliers. The keyword here is "ad impression". By definition, "it is one successful ad call or one ad loading on a webpage is one ad impression" (Driskill,2017). Yet, it is important to differentiate it from a "page impression" which refers to "when the webpage itself loads" (Driskill, 2017).

Advertising Networks constitute the intermediary between advertisers and publishers. They integrate ad inventory from different publishers and provide advertisers with a gigantic pool of ad impressions. Advertisers can use Demand Side Platforms (DSPs) and Data Management Platform (DMPs) to gain personalized insights about their ideal target audience for their digital campaign and pick out slots from an ad network's inventory to optimize their digital ad efforts. According to Martech, the leading ad networks, in the digital advertising market, are Google DoubleClick Ad Exchange, Taboola, Baidu, Rocket Fuel, and Infolinks.

Another pillar in the Ad tech ecosystem is **Ad Exchange.** It constitutes "a virtual marketplace where publishers and advertisers trade digital ad inventory". In other words, it is a digital platform that is utilized, on one hand, by publishers to offer/sell their ad space inventory, and as

for advertisers, on the other hand to serve as a digital marketplace for by bidding on ad inventory. Anad exchange is beneficial for advertisers for many reasons. First, it offers a gigantic pool of ad impressions to select from. Second, advertisers here have greater autonomy over their digital ad campaign placement unlike when they bid via an ad network. Third, advertisers have maximum ad optimization by using various digital ad strategies for targeting their audience such as geo-marketing, remarketing, behavioral targeting...etc.

AD exchange has 3 popular types: Open ad exchange, Private ad exchange, and Preferred deal. Briefly explained, an **open ad exchange** is a virtual marketplace that is a repository of listings from the sheer volume of various publishers. Yet, the detailed information about these publishers is blocked from the advertisers, which is not the case in a private marketplace. The main merit of this type of ad exchange is the great volume that it receives.The main drawback with open marketplaces is the aspect of security, especially that digital ad fraud is on the rise, thus advertisers have become more inclined to the **Private ad exchange.** As for the latter, it allows publishers to control the terms and conditions of the bid more than Open ad exchange. In this scenario, publishers decide which buyers (advertisers) can place bids, the price of the bidding, and under what conditions. One main benefit of this type of ad exchange is the superior quality of The quality of inventory available. The third type of ad exchange is the **Preferred deal.** It allows publishers a chance to sell digital ad inventory and impressions to specific advertisers, after price negotiations between the parties. **Google ad Exchange, Open X, App Nexus, and Smarty Ads** are some of the leading ad exchange examples.

Needless to say that artificial intelligence has recently become a cornerstone in all these processes that occur in the AdTech ecosystem. Each process of this is thoroughly explained in

the section named Media planning and buying as a part of the "New Four-Step AI-enabled advertising process".

Digital Advertising Metrics

In general, Metrics aid advertisers decide on the next steps to take with sureness. First Metric is **Reach and Impressions**. 'Reach' signifies the number of users who were able to see the ad. 'Impressions' signifies the number of times the ad was shown. In other words, an ad can be displayed to the same individual more than once; thus, the number of impressions might be higher than the 'reach' in many cases. Second The second metric is the **Click-Through Rate (CTR)** which is the percentage of clicks to impressions. Thus, if the advertiser gets two clicks every 100 impressions, the advertiser's CTR is 2 percent. Advertisers can use this metric to grasp the effectiveness of various online ad campaigns. For example, if the advertiser receives the same number of impressions on two different campaigns, the campaign with more clicks will have a better CTR and subsequently will have performed better. The third metric is **Conversions** which are the number of users that accomplished the intended action by clicking on the ad by following your Call to Action (CTA). The action could be purchasing a product or signing up for service. The Fourth metric is **Cost Per Acquisition,** it is also known as **"Cost per Action" (CPA).** It measures the average cost incurred to acquire a paying consumer. User's actions may include "clicks, sales, downloads, form submissions." CPA metric is "the ratio between the total cost of the campaign divided by the number of actions occurred." It can be calculated by dividing the total campaign expenditure by the number of conversions. The fifth digital advertising metric is **Return on Investment (ROI)** which is the utmost metric to evaluate the effectiveness of ad campaigns. It is also known as **Return on Ad Spend (ROAS)**, which

measures how much revenue the campaign generates compared to the cost needed to run the campaign. It is worth mentioning that these metrics are useful regardless of the digital ad format.

1.2.13 The New Four-Step AI-enabled Online Advertising Process

In a recent article titled "*The Impact of AI on the Advertising Process: The Chinese Experience (2019)*", Qin & Jiang tried to examine the latest developments in China's digital advertising industry over the past five years. Consequently, they proposed a four-step process of AI advertising, a reorganized and upgraded version of the advertising process. Four steps are "consumer insight discovery, advertising creation, media planning, and buying and finally advertising evaluation". In the upcoming 4 sections, each step in the process is extensively elaborated by synthesizing the literature that pertains to the steps of the digital "Smart advertising" process and AI role in each of them. However, most references and use cases are Chinese due to the lack of other international literature on AI implications in advertising.
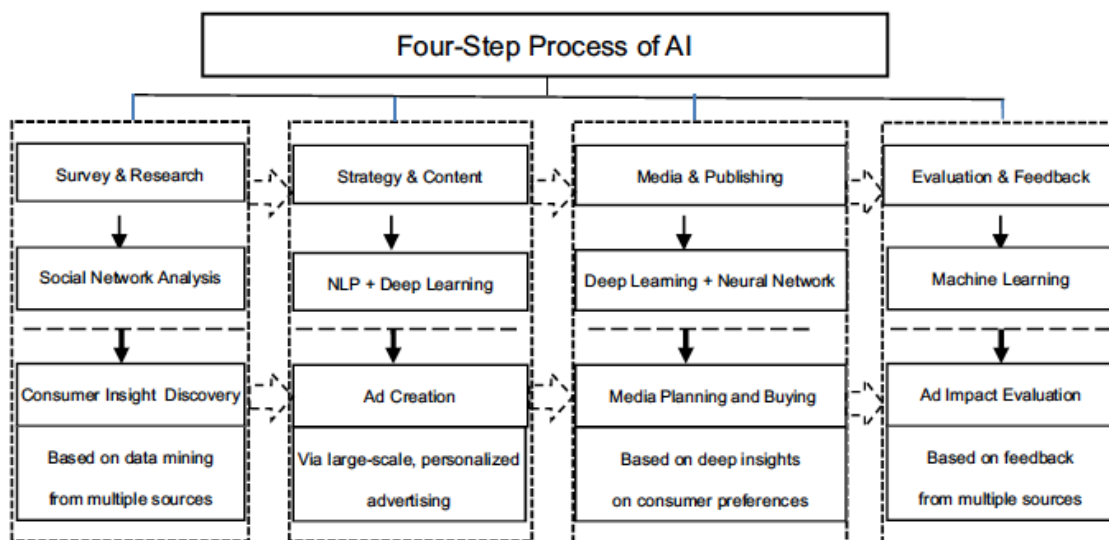
Figure 2: Qin and Jiang's AI-enabled Digital Advertising Process (2019)

1.2.14 AI Application in Digital Advertising Research and Consumer Insight Discovery

The research is a pivotal step before the creation and development of advertisement creative. Advertising agencies conduct a full-fledged advertising research as it aids in improving the position of brands, predicting likely issues, monitoring progress, and limiting the chances of failures. The application of AI technologies blend advertising research and market analysis into one whole step. "AI technologies are used for real-time data gathering and processing. Data gathering might involve using Internet monitoring technologies to capture online data or utilizing cameras to acquire real-time consumer data" (Qin and Jiang, 2019).

Over the past two years, there has been enormous progress in "processing unstructured data" which means that "unstructured data such as pictures, videos, and audio can be converted into analyzable content with the help of natural language processing (NLP) and preprocessing technologies" (Qin and Jiang, 2019).

Specifically talking, "social network analysis technologies" are applied to integrate and "convert" advertising research and market analysis into one outcome titled "consumer insight discovery." The latter refers to the use of "social network analysis technologies to analyze massive amounts of data from multiple sources and of different structures in the advertising market; to construct a measurement system for consumers' digital lifestyles; and to acquire insight into what consumers reallywant" (Qin and Jiang, 2019). Advertisers usually divide their market based on various psychographics of their customer base, possibly to find out who their "best" customers are and analyze specific purchasing endeavors. Personality traits that are crucial in people's lives eventually become a part of their language. Here, AI can reveal personality tendencies, needs, and wants of online consumers by reasoning with

people'scomments and posts on any digital media channel; social media networks. To getpersonalized information about online users, their online lifestyle and "behavioral trajectories" are deeply explored and mined. Additionally, "with GPS and GIS site information, the prefix-scan algorithm is used to extract frequent sequential activity patterns in daily life, and with travel patterns, consumers' daily behavioral trajectories are mined" (Feng and Zhu 2016; Shou and Di 2018).Through all of this analysis, "a comprehensive insight into users' individualized information from both online and offline sources is gained" (Dougnon et al. 2016; Vourvopoulos, Bermude, Badia, and Liarokapis 2017). For example, Dentsu Aegis Network uses "AI technologies to check and dissect pictures posted on social media networks, such as "Weibo.com (China's Twitter) and Dianping.com (China's Yelp)", not only to gain insights into "dietary preferences" in Guangdong Province in different periods but it also to offer, in turn, clarifications of reasons for the decline of sales at the restaurants in areas in China relative to other regions.

With AI, it is possible to grasp growing "wants and needs in real-time," as online users speak them out through digital channels, and build "richer profiles" more swiftly. The report generated by McKinsey conveys that "today's technology has reached the point where marketers (advertisers as well) can easily produce real-time personalization." (Keitzmann,2018). Media company "*Astro*" uses "Microsoft's AI system Azure" for consumer profiling. The system "crunches billions of data in seconds to find out individuals' needs and wants." Then, it caters to online content on Astro's platform in real-time to adjusttothose consumer interests. As consumers' "digital footprints develop, through social-media status updates, purchasing

behavior, or online comments and posts, machine learning continuously updates these profiles" (Keitzmann,2018).

A key advertising objective is "when consumers begin to deliberate possible offerings to satisfy their needs or wants is to insert the brand into consumers' consideration set" (Batra and Keller, 2016). In other words, advertising includes increasing the brand's visibility and persuading the audience with key reasons for consideration. Accomplishing this goal, advertisers can seize "search optimization", with "paid search advertisements", "organic search", or advertising retargeting (remarketing). Here, AI helps search to distinguish, "rank", and show results that will meet the required consumer data at that specific time. Google Adwords helps advertisers make clearer distinctions between "qualified" and "unqualified leads" for more efficient targeting. Additionally, "Google analyzes search-query data by considering not only keywords but also context words and phrases, consumer activity data, and other big data" (Keitzmann,2018).

There are multiple ways to gain even deeper consumer insight discovery. "When consumers narrow down their list of brand choices, advertising aims to instill trust in the offering and persuade them that they are making the best choices" (Batra and Keller, 2016). One tactic is targeting online users who have high purchase intent and giving them credible and convincing ad content. According to Keitzamann, AI boosts these tasks in three fundamental ways. First, "predictive lead scoring, through machine learning". It allows advertisers to make precise forecasts aboutonline consumers' purchase intention. A "machine-learning algorithm runs through a database of verified existing customer data; recognizes trends and patterns; and then, after appending additional external data on consumer activities and interests, creates robust lead profiles for advertisers' ' (Keitzamann,2018). Second, "machine learning and image, speech, and

natural language generation" that advertisers use to "curate content while learning from consumer behavior in real-time and adjusting content on the fly". Third, "marketers and advertisers use emotion AI" to grasp online consumers' attitudes towards their brands publicly, such as online reviews in blogs, or videos on various digital channels. Affectiva is a leading global example for applying Emotion AI using deep learning as mentioned in a previous section titled Emotion AI. "Kellogg that used Affectiva's emotion AI software to help devise an advertising campaign for its Crunchy Nut cereal, eliminating advertisement executions when viewers' engagement dropped on viewing the advertisement multiple times" (Keitzamann, 2018).

Lastly,for decades, quantitative advertising research has heavily depended on "structured data" from surveys and experiments, which led to analyses with "classical multivariate methods such as regression, analysis of variance (ANOVAs), factor analysis, and structural equations modeling (SEM)". On the other hand, a myriad of big data consists of networks, text, images, audio, and video that are classified as "unstructured data" and are not "a matrix of numbers." Thus, it will be cost and time exhausting to apply the traditional statistical methods. Consequently, many tools, supported with AI technology that analyze text and network data are currently included in various commercial software packages. Indeed, there are opportunities for advertising researchers to explore and develop advertising applications with them. Not only do Huh et al. (2017) develop "network applications", but also Liu, Burns, and Hou (2017) have developed "applications of text mining." As for the "image processing" field, many advances have recently evolved like "Google Cloud Vision" by "using deep learning neural networks."

1.2.15 AI Application in Ad Creation

As AI technology is moving towards its peak, multiple AI-powered systemscan create full or partial ad campaigns for advertisers. Natural language processing (NLP) and Natural Language Generation (NLG) are the twoAI-powered technologies which are used to produce individually personalized advertising designs or other creative elements such as images and texts. Although Nie (2017) and Yang, Liu, and Zhang (2017) suggested that "AI technologies can be applied to the copywriting in direct-mail advertising and the design in print advertising, they fail to provide in-depth analysis of the technical logic and explain the technological process."

There is a debate on whetherAI-based tech is way better than human written ad copies, or that "advertising creatives would not be replaced by big-data-fueled AI". One side of the debate says that "Automated Creativity" of ads is still inits early days, yet it is significant. Hardy et al argue that what automated creativity promises is the capability for machines to alter the content of the advertising based on the user seeing the ad, where he/she is, time of the day, and contextual information such as activity type that the user is involved at while watching the ad. Think of L'oreal and Google's DoubleClick example. They were able to personalize the content of online ads for suncream based on whether a woman had children or not (Double click, 2016).

L'Oreal designed a campaign for two of their Vichy sunscreen products to run in France during the summer. One of the sunscreen products was for women and the other for children. They wanted to show a relevant product and message to women to do online shopping for themselves vs. women do online shopping for their children. "The Optimedia team used audience targeting lists to show the different creative units to the "women" segment and the "women with children" segment. Interestingly, they found that the "women with children" segment had a higher conversion rate than the "women" segment" (Double Click, 2016).

Hardy et al argue that the idea of machines will take over the creative department areto miss the point of automated creativity. In reality, authors stress the notion that advertisers "shouldn't expect robo-writers to learn cultural codes, values, aesthetics, humor, nuances of natural human languages" (Hardy, 2018). What is more pivotal is the capacity to "optimize" creative content according to principles of relevance.

Moving to the more aspiring side of the capability of AI in content creation, there are AI tools like *Wordsmith* that develop "human-sounding, original content, from personalized emails to news articles." "*Saatchi LA* trained *IBM Watson* to write thousands of advertisement copies for Toyota; the copy was tailored to more than 100 different customer segments" (Kietzmann et al, 2018). As for speech recognition, AI technology provides meaningful voiceovers for advertisements. "The film company 20th Century Fox created a trailer for the science-fiction horror film Morgan using images, speech, and natural language generation" (Kietzmann et al, 2018). Interestingly, Key ad agencies such as Leo Digital Network and Dentsu Aegis Network have seen premier progress in developing "smart copywriting systems" that are self-adaptive. In 2018, "JD, a Chinese e-commerce platform, designed and launched *Shakespeare*, a smart copywriting system, to provide automatic writing services (e.g., product descriptions and copywriting) to vendors on the JD e-commerce marketplace" (Qin and Ziang, 2019). The system analyzes "search keywords" typed in by online consumers. Then, it swiftly generates "matching merchandising descriptions", and subsequently creates ad content. It automatically saves in its data set the descriptions chosen by online consumers and "prioritizes them high on the recommendation list in the following time a similar search takes place." Interestingly, it permits "self-adaptive learning" based on online consumers' feedback and modifies the content accordingly. Currently, it can produce paragraphs.

Ad Creation no longer depends on personal experience. Advertisements are instead data-based produced. If advertisers decided to use celebrity endorsement in the creative strategy, it is becoming more common to choose methods in the decision-making process that are data-driven. In the traditional method, the advertiser selects the model that he/she desires which is the top-down method. "By analyzing online social media buzz, agencies can select a model who is expected to appeal most to the target audience or use a model that best fits the consumer or product image" (Heraldcorp.com, 2019).

Moving to the Ad design, AI has recently started to play a crucial role. In 2016, China's most giant e-commerce platform, Alibaba, launched "the Luban System through its AI Lab." Mainly, it is used to "design posters for Taobao.com and TMall Marketplace, both of which belong to the same conglomerate as Alibaba." In the context of the AI-empowered advertising process, advertisers infer results from the "consumer insight discovery" step. Then, the online user's preferences for creative advertising are derived. For example, "the cascade method" based on the "independent cascade model" (Kleinberg, 2007) is adopted to calculate the probability that one social entity will consider social influence" (Chen et al. 2009). "Certain AI technologies, such as target semantic extraction, correlation analysis, cross-media information retrieval based on content, sentiment analysis, and topic analysis (Abbasi et al. 2018; Deng et al. 2019), are used to extract the algorithmic logic of advertising content creation. Last, "targeted ad creation is carried out based on the model that matches advertising ideas to user touchpoints" (Qin and Ziang,2019). With the aid of "algorithms for ad creation", tailored ad content is made automatically ona wide scale.
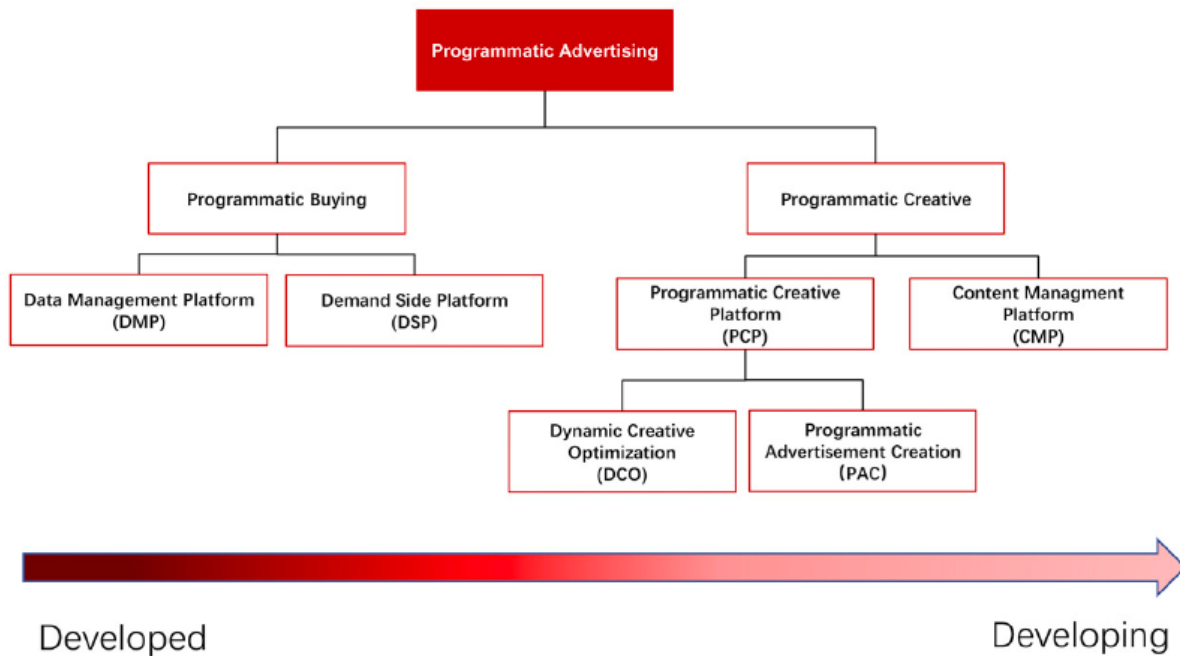
Figure 3: Chen et al's Programmatic Creative (2019)

In a research study titled "*Understanding Programmatic Creative: The Role of AI",* the
authors expand the concept of "programmatic advertising" to include "programmatic creative" as
a vital component. The latter integrates the "programmatic creative platform (PCP) and content
management platform (CMP)" to facilitate the creative process in this consumer-centered and
data-driven marketplace." Programmatic creative platform (PCP) consists of "dynamic creative
optimization (DCO)" (Lennon, 2017) and "programmatic advertisement creation (PAC)". The
goal of PCP is to "generate large-scale personalized and contextualized advertising messages in
real-time."

PCP pushes advertisement designs to converge to the most effective level, thus, instead
of communicating one "generic" advertisement to mass online target users, PCP can produce
various personalized digital ads for multiple online audiences. Advertisers can decide the
"degree of automation". For "a low-automation scenario", decision-makers in the advertising

field can pick out most of the "creative content" while letting PCP adjust the size dimensions of an ad, adapting itself to various screen sizes of digital devices. For a "high-automation scenario", PCP can decide "design templates, ad copy, and pictures for the advertisements according to the advertiser's strategic planning inputs." Accordingly, this high automation scenario boosts the effectiveness by "ensuring readability of advertisements on an individual basis." Think of Kuaizi Technology. It is a leading PCP provider in China. "Facebook and Instagram certify it as a creative platform" (Chen et al, 2019). This PCP can produce thousands of unique and different designs of digital ad campaigns for any given product or service. "Machine learning algorithms can predict the performance of these advertisements and select the one that best fits the interests of a target audience member according to his or her tags."

After the advertisement, "the machine learning algorithm will use real-time performance data to fine-tune the model and optimize the advertisement for the next round." Without PCP technology, "it is prohibitively expensive and slow for advertisers to do such a process manually" (Chen et al,2019). Connecting it to digital ad formats, the PCP can be applied to both "display advertisements" and "video advertisements". For example, "Kuaizi Technology can break down a video advertisement into several shorter clips and rearrange the clips in different orders to create new video advertisements" (Chen et al, 2019).

Due to the limitation of AI tech in "judging" an ad, advertisers must rely on genuine online user's evaluations to decide its effectiveness. Yet, AI technology has a feature called "DCO" that enables advertisers to test in parallel "the performance of many variations of advertisement design in different contexts at the same time." Subsequently, advertisers can judge the elements of creative content, the target audience, and the timing of exposing the ad to the intended consumer. By analyzing the "real-time performance data" using machine learning

algorithms, DCO can aid PAC to boost "ads content quality and maximizes the effectiveness of an ad on the go." For example, by initially preparing and choosing creative elements such as ad copy, product image, color, banner size, banner position, and other elements, "agencies can figure out the best creative combination that would facilitate acquiring the best results through real-time A/B testing" (Chen et al, 2019). "Context, such as location, time of day, and the weather will affect how consumers process advertising messages" (Ghose, Goldfarb, and Han 2012; Li et al. 2017). When PCP goes hand in hand with DSP, advertisers are enabled to create and send personally tailored messages to online users according to the context on a wide scale. Online consumer's interests may change overnight, although his/ her demographics data remain the same, which may consequently affect the "communication effectiveness of advertising"

As for "automatic copywriting", PCP is making progress. It can adjust or "insert" specific keywords in an advertisement depending on the online user's big data. For example, "PCP can add the location name in the advertisement text to make the target audience member feel that the message is relevant to him or her" (Chen et al, 2019). Alibaba has provided an AI-enabled copywriting service to its business partners. "This AI copywriter can produce 20,000 lines of copy per second" (Lacy, 2018).

True that traditional "A/B testing" lets the practitioners in the advertising field compare the performance of advertisement designs. However, "the results can only suggest which advertisement works better without demonstrating the independent contribution of each creative element and their synergy effect when they are combined with the rest of the creative elements" (Chen et al, 2019). In a comparative sense, DCO, "due to its interconnectedness with Programmatic Creative Platform (PCP)", can measure both "the independent effect of each creative element and the interaction effects of creative element mix" (Chen et al, 2019).

Admittedly, AI "copywriting technology" is still in its nascent era. Natural Language Processing (NLP) has limitations. Hence, it is recommended, "only for creating promotion-oriented copy for small businesses." However, "we believe the technology will gradually improve and eventually take over more sophisticated tasks and serve larger clients" (Chen et al, 2019). For example, "Facebook AI and the University of Washington developed RoBERTa, an NLP model that sets the standard in AI reading comprehension" (Liu et al. 2019). To shed light on some of the limits of programmatic Advertising Creation (PAC), it does not know, alone, which ad design, according to consumer's tag, is the best to pick out. Thus, "PAC has to work closely with DCO to optimize and come up with better designs." For example, after advertisers choose the theme of the digital advertising strategy, the programmatic creative module picks out "creative elements" and comes up with a myriad of designs. Then, the DCO module "tests those designs on different target audiences." "The DCO module discards the poorly performing designs and pursues optimizing the well-performing designs." "While DCO improves the quality of advertisements, it also expands the pool of target audiences to reach broader coverage and ensure the robustness of advertisements" (Chen et al, 2019).

It is worth mentioning that PCP should contrast with "traditional creative templates." Creative templates lessen the workload of "creative personnel" by introducing some generic frameworks. "If the objective of the advertisement creation is simple, templates may be sufficient because designers can simply fill in the blanks" (Chen et al, 2019). However, "PCP must work with Content Management Platform (CMP) to utilize content big data."

Moving to the Content Management Platform (CMP), "the quality standard of advertisement content requires advertisers to adopt CMP to collect and manage content big data." An advertisement is a creative mix and match of "creative elements". Thus, PCP needs a big number of "creative raw materials". The solution to this issue is the CMP that does this task perfectly. It assembles creative elements from different sources, "creates tags for the elements, and provides them to PCP to generate personalized and contextualized advertisements" (Chen et al, 2019). None of these results can be reached without" state-of-the-art AI algorithms." For example, "Luban, Alibaba's programmatic advertising creation service, can automatically adjust the content, design style, information complexity, colors, and so on. During the 2018 "Double 11" shopping festival, Luban designed about 6 million banner advertisements for 200,000 merchants" (Alibaba Cloud Enterprise Application Team, 2018).

It is crucial to differentiate between CMP and the traditional "stock photography databases" such as "Getty Images" which have gathered a myriad of photographs for advertisers to use in ad creation. However, the traditional stock photography databases cannot perform the CMP task. The latter can "decompose the content, identify useful elements, and enrich the creative element library" (Chen et al, 2019). "It is time-consuming for a designer to perform this task manually; thus AI can greatly improve efficiency by automating this process" (Chen et al, 2019).

1.2.16 AI Application in Media Planning and Buying

Historically, advertisers have conducted quantitative research by buying data sets such as "scanner panels, media panels" from syndicated services such as IRI, Nielsen. Then, they apply "statistical models to better grasp the customer and assess advertising effect." However, such datasets lack comprehensiveness and customizing details. Indeed, they tend to cover "a small representative set of households" and record a small number of "data points per household." Moreover, "these data sets are considered static due to their low update frequencies" (Chen at al, 2019). Thus, "traditional research generally uses segmentation to divide the audiences into large interpretable groups while making ad hoc assumptions about the homogeneity within each segment" (Chen et al, 2019).

Recently, AI tech in media planning and buying essentially takes place in "programmatic buying" or "Automated Advertising purchase". By definition, programmatic buying ".. optimizes the effect of correcting and tracking the way the advertisement is executed by exposing the right message to the right people at the right time in the most cost-effective manner through data-based real-time bidding (RTB)" (Lee et al, 2019). It is substantially unique from the current method of advertising execution, in which advertisers and publishers "manually buy and execute advertising media offline" and measure post-campaign effectiveness only through surveys. This uniqueness is mainly due to "the fact that programmatic buying is aimed at buying 'audience' rather than ' media'" (Lee et al, 2019). "Programmatic media buying is the predominant digital advertisement placement process, accounting for more than 80% of digital advertising spending" (IAB, 2018). It is built on two advanced tools: "Data Management Platform (DMP)" and "Demand Side Platform (DSP)" and AI come to support both to enable the "programmatic buying" process.

"Advertisers utilize the massive amount of user data provided by DMP to evaluate each potential impression opportunity and strategically bid for it using machine learning algorithms via DSP" (Chen et al, 2019).

DMP plays a crucial role in this step of advertising by drawing an exhaustive "tag" for each online user by collecting data from various digital devices. DMP serves "as a unified technology platform that intakes disparate first-, second-, and third-party data sets provide normalization and segmentation on those data and allow a client to push the resulting segmentation into live, interactive channel environments|" (Wang et al. 2019). "Machine learning algorithms can transform such high dimensional data to generate thousands of "tags" to infer a user's attributes, including demographic information, location information, temporal information, channel information, behavioral information, values/lifestyles information, and interest information" (Duan and Yang 2018). "DMP can pool billions of unique user big data and allow individualized segmentation and advertisers can see each user as a combination of tags and precisely pin down each target by selecting a desirable mix of tags" (Chen et al, 2019).

Moreover, machine learning such as "collaborative filtering" will have a more effective performance by the escalating number of observations. "Because the clickstream data can help identify the preference of a user, a real-time recommender system can push a potential solution to the user while he or she is navigating through different pages" (Chen and Yao 2017; Kumar et al. 2019).

However, there are limitations toAI-enabled DMP. Neumann, Tucker, and Whitfield (2019) conducted a "series of field studies across 19 Australian DMPs." The results present that DMPs fundamentally differ in quality. "Although DMP can help identify user attributes, the cost of the targeting solution may make it economically unappealing" (Neumann et al, 2019).

Moreover, DMP cannot implement "qualitative research" methods like focus groups, in-depth interviews, and observations which are characterized by providing valuable deep customer insights.

Moving to the "Demand Side Platform (DSP)", this technique is the essence of AI-enabled programmatic buying. It aids practitioners in the advertising sector to strategically target online users and "do real-time bidding (RTB) to buy impressions". "To complete the auction in milliseconds and generate revenue for advertisers, DSP needs to predict the click-through rate (CTR) of an advertisement impression" (Chen et al, 2019). Hence, "DSP takes advantage of machine learning algorithms, such as neural networks, to uncover hidden layers of tags by computing the weighted combinations of tags" (Rauber et al. 2016). In a comparative sense, it goes beyond "traditional intuitive by revealing consumer attributes and needs interpretation". For example, a female user may be following a social media account about luxury bags, installing a "cryptocurrency trading" app, and visiting "high-end restaurants". Conjointly, these "tags" may point out a person's interest in purchasing a luxury house in an affluent compound. Consequently, an advertiser can increase the "bid price" via "DSP after deducing such interests from the user's big data". In other words, programmatic buying pushes advertisement messages to thousands of interested users in favorable contexts.

Real-time bidding (RTB) is a pivotal term in this discussion. Real-Time Bidding is an "auction setting where ad impressions are sold and bought, and transactions take place in a blink of an eye" (Graham, 2019) Needless to say that it fits the discussion as it goes with implementing online campaigns and digital marketing. "Once an advertiser's bid wins the auction, their digital ad is instantaneously shown on the website or property of the publisher" (Graham, 2019). Supporting platforms such as "Ad Exchanges" and "Supply Side Platforms" are

also utilized within the process. A supply-side platform or Sell-Side Platform (SSP) is a type ofadvertising technology (adtech) that aids publishers and online media owners optimize their ad inventory in an efficient and automated way. In other words, SSP is a software that has "publisher's ad space information" and enables them to sell different digital ad types such as display, video, remarketing, search engine ads, mobile ads, and digital-out-of-home (DOOH), etc. Publishers traditionally would use manual ways to assign an ad to each space. Yet, as the number of digital advertising has been rising and lots of advertisers compete for ad space, the ad tech with its tools and it is where supply-side platforms appear. Working hand in hand with DSP, they get a look ata digital publisher's total inventory, evaluate the advertisers and content available, and recommend the best match for every space.

Google, for instance, has an ad space that is covered by many digital advertisers. Its supply-side platform informs the ad exchange that there is a space available for ads. It waits for the different demand-side platforms to send their bid. Based on the bid price, space is sold to the advertiser and the digital ad is instantaneously published. SSPs send potential impressions into ad exchanges, where DSPs purchase them on marketers' behalf, depending on specific targeting attributes and audience data. Despite being around for over a decade now, supply-side platforms continue to be a fast-growing landscape. They are now a must-have for any publisher's toolkit and the foundation for breakthrough new ideas such as AI-based programmatic ads. A report from Juniper Research has estimated that "algorithms used in bidding within RTB networks could be generating more than $40 billion annually in 2021 compared to a mere $3.5 billion in 2017" (Graham, 2019)

"Big data is crucial for programmatic advertising. Big data enables buyers and sellers to determine the most appropriate target audience for an advertising message"

(Malthouse, Maslowska, and Franks 2018). Think of streaming services. They depend on the integration of subscription fees and advertising profits. "They own device-level viewing logs of all their customers, which is a big data asset that has potential value to advertisers" (Malthouse and Li, 2017). "Google" is an example. It does not only make and disseminate content but Google also "has similar unique data assets, because it knows searches and distributes media. Such data can inform media planning decisions on which programs to buy" (Malthouse and Li, 2017).

To cut it short, according to the literature mentioned above, "programmatic advertising" is developed aiming at "replacing human negotiations with machine learning and AI-optimization"(Malthouse and Li, 2017), to boost"efficiency and transparency" to both the practitioners in the advertising field and the publisher

1.2.17 AI Application in Digital Advertising Performance Evaluation

Ad impact evaluation indicates "the acquisition of accurate and timely feedback from the ad impact data collected in real-time monitoring of media planning and buying" (Qin and Jiang, 2019). The impact of digital ads is measured with AI technologies such as Machine Learning and Deep Learning to collect "real-time feedback data" from big data of different digital channels in various formats such as numeric, photos, voice, texts, or videos. "The multidimensional semantic information is obtained by using two-channel convolutional neural networks (CNNs), while CNNs can be trained on top of pre-trained word vectors for sentence-level classification tasks" (Kim 2014). "Machine learning methods are used to extract and fuse feedback data features" (Thi, Le, and Dinh 2015). In this way, the impact of advertising is measured, and a "smart analysis" is run to compare the ad influence vs. its initial planned ad. goals.

Second, after the analysis for ad influence, "adjustments" are made not only to targets of media planning and buying but also made to the ad content. "When the expected objectives and goals are not achieved, both the targets and the content must be taken into consideration to reveal the causes so that smart responses can be made accordingly" (Qin and Jiang, 2019). This notion resonates with what Hardy et al argue. They explain that automated creativity facilitates testing, monitoring of campaign performance, and "real-time refinement" of ads to trigger higher effectiveness rates. On one hand, "according to the feedback data, the performance indicator system for media planning and buying is updated or reconstructed through deep learning and knowledge mapping, and the targets of media planning and buying are also adjusted" (Qin and Jiang, 2019). On the other hand, "the knowledge-aware bidirectional long short-term memory (KBLSTM) model is used to leverage a knowledge graph so as to improve the text learning method of cyclic neural network" (Yang and Mitchell 2017), "reevaluate users' personalized expressions in feedback", and starts "the smart selection of response strategies" to alter the ad content. AI technologies make the "seconds optimization possible by shortening the gap between the impact evaluation and optimization to a matter of seconds; therefore, the integration and synchronization of impact evaluation and responsive improvement are realized" (Qin and Jiang, 2019). Mars, Inc. is a success story of using emotional AI and its tools of Machine Learning and Deep learning in the ad evaluation phase. Mars wanted to assess if their advertising elicited the intended emotion of their consumers and if their emotional feedback to the ad could predict sales. Using *Affdex for Market Research,* Mars and Affectiva developed the first and largest research study connecting consumers' facial reactions and emotional responses to sales volume and effectiveness prediction, even short-term sales. "Over 1,500 participants from

France, Germany, UK & the US viewed over 200 ads, while their facial reactions were captured via webcam, and emotional responses were analyzed" (Affectiva Media Analytics). Using single-source data, the consumers' emotional reactions were linked to the sales volume for each product line: chocolate, gum, and instant foods. Interestingly, with Affdex, Mars discovered that across its product lines, chocolate ads triggered the highest emotional engagement, while food ads triggered the least; "and across markets, the US was the most expressive while the UK was the least expressive" (Affectiva Media Analytics).

Affdex facial coding and emotion analytics was capable of accurately predicting short-term sales more than relying on "self-report methods alone". However, "combining facial coding with the self-report survey provided the best sales prediction results, with an accuracy of 75%."

Last but not least, an evaluation step in digital advertising can be implemented before advertising production. Dynamic Creative Optimization (DCO) is a vigorous tool for pretesting. DCO has two advantages over advertising pretesting. According to Chen et al (2019), DCO, first, "allows advertisers to test the real market response from real customers. Consequently, the test results have strong external validity and robustness." Second, it is also a cost-effective testing method.

L'Oreal Vichy Case Study:

In the literature review sections, the researcher provided examples in explaining how brands in various industries applied AI across each stage in their online advertising. However, this section is dedicated more to include the l'Oreal Vichy experiment from Double Click Goggle research to showcase each phase "in action."

Starting with the consumer insights stage, L'oreal Vichy gathered all the online data available about their audience and their contextual signals. This aids them alot in narrowing down which online user insights to apply to their online campaign. Additionally, it informed the creative brief and ultimately determined messaging. In action, L'Oreal designed a campaign for two of their Vichy sunscreen products to run in France during the summer. There are two types of sunscreens; one was for women; the other for children. L'oreal wanted to display more personalized ad content with tailored product offerings according to who is viewing the ad; women shopping for themselves vs. women shopping for their children. "The Optimedia team used audience targeting lists to show the different creative units to the "women" segment and the "women with children" segment. Interestingly, they found that the "women with children" segment had a higher conversion rate than the "women" segment." (Doubleclick Google, 2018)

Moving to the Ad creation stage, the brand worked with media agency Optimedia and creative agency Fancy Pants Group. Together, they built out dynamic creative templates and a dynamic feed that could show different imagery and copy to two different audience segments: women, and women with children. Moreover, it could show a promotional gift to some viewers but not others, to examine whether the gift impacted click-through and engagement. Furthermore, they

wanted to display the nearest store location to viewers based on their post code, to help them complete an in-store purchase. In the design phase, the Vichy team provided direction on which elements they wanted to be dynamic: lifestyle imagery, copy, product image, most approximate store, and CTA. Thus, the design team created mock-ups of the creative for Vichy to approve. Once the strategy was set, dynamic elements selected, and design approved, the feed was developed to bring together dynamic content with corresponding data triggers. From this point, "the FancyPants team was able to develop the dynamic creative templates in HTML5." (Double Click Google, 2018)

In the Media planning and buying, L'Oreal used the integrated DoubleClick platform to plan, build, execute and measure the campaigns. Using that AI-supported software, it efficiently connected data to creative and set up dynamic campaigns, with intuitive workflows and seamless integrations between creative development tools, ad server, analytics, and DSP. L'oreal Vichy was able to complete trafficking tasks with just a few clicks. The creatives were automatically syncing with the ad server and DSP, meaning no manual handoff. This saved time and money.

As for the evaluation stage, it is connected to the media planning and buying as elaborated in the process model of the study, and it is more of a built-up from the previous stages; consumers insights and ad creation. In L'oreal Vichy case study, they automatically run reports and their online ads were easily optimized based on information obtained from the robust reporting suite and attribution tools. It is worth-mentioning that the evaluation phase is dynamic optimization to the media planning and buying as well as creative elements. It actually goes back and forth between each stage prior to monitoring the campaign.

Chapter 2: Conceptual Model

The researcher developed a conceptual model that is mainly derived from Qin and Ziang's Four-step Artificial Intelligence (AI) Advertising process that is mentioned in the literature review **(Figure 2)**. The developed conceptual model is called the *Process Model for Utilization of AI in Online Advertising and its Perceived Effectiveness.* Not only does the process model thoroughly tests the utilization of AI in 4 main steps of online advertising and the connection between each step to the next one, but it also measures the impact of each step on the overall effectiveness of online advertising. As shown **in Table 2**, the model has 5 constructs or 5 RQs that are measured. Each one is fully explained below. It is worth mentioning that **figure 4** shows the process model from the perspective of thekey 5 RQs/Constructs. The second model adds up some AI-embedded tools that are utilized in online advertising. This section starts by explaining the 5 RQs and 5 tested relationships.

2.1 Research Questions

Backed by the conceptual model of this paper, five main research questions explore the utilization of Artificial Intelligence in the online advertising process and its effectiveness.

RQ1: What is the utilization of AI in consumer insights discovery in the online advertising process?

RQ2: What is the utilization of AI in the online ad creation?

RQ3: What is the utilization of AI in online media planning and buying?

RQ4: What is the utilization of AI in ad monitoring and evaluation?

RQ5: What is the impact of using AI in the previous 4 stages on the overall effectiveness of online advertising?

Table 2: Research Questions

RQ1: What is the utilization of AI in consumer insights discovery in the online advertising process?	RQ2: What is the utilization of AI in the online ad creation?	RQ3: What is the utilization of AI in online media planning and buying?	RQ4: What is the utilization of AI in ad monitoring and evaluation?	RQ5: Is using AI in online advertising effective?
1. We acquire and use real-time big data to reach consumer insights. 2. We apply Natural Language Processing (NLP) to analyze and reveal online consumer attitudes and preferences. 3. We use Emotion AI software to understand consumer emotional engagement with various digital ads. 4. We use machine learning (ML) to make precise forecasts about online consumers' purchase intention. 5. We use AI to create strong lead profiles 6. We use AI to make efficient audience segmentation and/or targeting. 7. Overall, we collect and analyze big data of online consumers efficiently with AI technology.	1- We apply AI technology to tailor ad texts and images based on consumer's demographics, psychographics, and/or online behavior. 2- We fully integrate AI machines into the creative department. 3- We use AI to judge elements of creative content. 4- We use Content Management Platform (CMP) to select the best creative assets online. 5- We use AI to create tags for creative elements. 6- We use Programmatic Advertising Creation (PAC) to fine-tune the ad content quality on the fly. 7- We use AI to design digital ads. 8- We use AI to create the ad copy. 9- We apply AI to help us quantify the effectiveness of creative ad elements	1- We use Programmatic Media buying to boost efficiency and transparency between advertisers and publishers. 2- We use AI to forecast the Click-Through-Rate (CTR) of an ad impression. 3- We apply Machine Learning and Deep Learning to understand digital consumer media consumption. 4- We use Facebook Ads Manager and/or Google Ads to execute media planning. 5- Our agency utilizes AI in the automated media planning and buying phase.	1- We use Machine Learning (ML) and Deep Learning (DL) to obtain real-time online consumer feedback on various digital ad formats (text, banner, and video). 2- We use ML and DL to assess consumer feedback in media planning and buying. 3- We use ML and DL to help us assess consumer feedback to use ad content. 4- We apply ML and DL in pretesting an ad. 5- We apply ML and DL in measuring the independent effect of creative elements on the target audience. 6- We use AI to monitor campaign performance. 7- Testing ads with AI technology allows us to assess online consumers' real-time responses.	1- We become more cost-effective after applying AI tools. 2- We become more time-efficient after applying AI tools. 3- We become more responsive to changing consumer preferences. 4- We become able to create measurable campaigns. 5- We become more able to meet campaign objectives.

2.2 Operationalization of Constructs

This section provides operational definitions for the 5 constructs used in the research questions. The constructs are all operationalized by multi-item scales using 5-point Likert scales, where "1" indicates the respondent strongly disagrees and "5" indicates they strongly agree. The multiple items are meant to capture the abstract, multidimensional nature of the construct and allow for rigorous measurement of its reliability.

The statements used in the Likert scale in the first 4 constructs are generally derived from *Qin and Jiang*'s Four-step Artificial Intelligence (AI) Advertising process (2019) and *Chen et al* model of Programmatic Advertising (2019). The researcher mainly focused on these two sources as the developed conceptual model is inspired by both. Nevertheless, some perceptual statements are derived from Affectiva Media Analytics, and others are added by the researcher.

Construct 1: Utilization of Artificial Intelligence in Consumer Insights Discovery

The following table shows the perceptual statements of the items used to operationalize the

first construct and shows the source of each item

Item	Source
1- We acquire and use real-time big data to reach consumer insights	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 - Edward C. Malthouse & Hairong Li (2017) Opportunities for and Pitfalls of Using Big Data in Advertising Research, Journal of Advertising, 46:2, 227-235, DOI: 10.1080/00913367.2017.1299653
2- We apply Natural Language Processing (NLP) to analyze and reveal online consumer attitudes and preferences.	Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
3- We use Emotion AI software to understand consumer emotional engagement with	- Affectiva Media Analytics. (n.d.). Retrieved from:https://www.affectiva.com/product/affdex-for-market-research/ - Kietzmann, Jan & Paschen, Jeannette & Treen, Emily. (2018).

various digital ads.	*Artificial Intelligence in Advertising: How Marketers Can Leverage Artificial Intelligence Along the Consumer Journey.* Journal of Advertising Research. 58. 263-267. 10.2501/JAR-2018-035.
4- We use Machine Learning (ML) to make precise forecasts about online consumers' purchase intention.	Kietzmann, Jan & Paschen, Jeannette & Treen, Emily. (2018). *Artificial Intelligence in Advertising: How Marketers Can Leverage Artificial Intelligence Along the Consumer Journey.* Journal of Advertising Research. 58. 263-267. 10.2501/JAR-2018-035.
5- We use AI to create strong lead profiles.	- Kietzmann, Jan & Paschen, Jeannette & Treen, Emily. (2018). *Artificial Intelligence in Advertising: How Marketers Can Leverage Artificial Intelligence Along the Consumer Journey.* Journal of Advertising Research. 58. 263-267. 10.2501/JAR-2018-035.
6- We use AI to make efficient audience segmentation and/ or targeting.	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 - Kietzmann, Jan & Paschen, Jeannette & Treen, Emily. (2018).

	Artificial Intelligence in Advertising: How Marketers Can Leverage Artificial Intelligence Along the Consumer Journey. Journal of Advertising Research. 58. 263-267. 10.2501/JAR-2018-035.
7- Overall, we collect and analyze big data of online consumers efficiently with AI technology.	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 - Edward C. Malthouse & Hairong Li (2017) Opportunities for and Pitfalls of Using Big Data in Advertising Research, Journal of Advertising, 46:2, 227-235, DOI: 10.1080/00913367.2017.1299653

Construct 2: Utilization of Artificial Intelligence in Ad creation

The following table shows the perceptual statements of the items used to operationalize the second construct and shows the source of each item

Item	Source
1- We apply AI technology to tailor ad texts and images based on consumer's demographics, psychographics, and/or online behavior.	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 - Abbasi, Ahmed, Yili Zhou, Shasha Deng, and Pengzhu Zhang (2018), "Text Analytics to Support Sense-Making in Social Media: A Language-Action Perspective," MIS Quarterly, 42 (2), 427–464. - Hardy, J., Powell, H., & MacRury, I. (2018). *The advertising handbook*. London; New York: Routledge, Taylor et Francis Group.
2- We fully integrate AI machines into the creative department.	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 - Hardy, J., Powell, H., & MacRury, I. (2018). *The*

	advertising handbook. London; New York: Routledge, Taylor et Francis Group.
3- We use AI to judge elements of creative content.	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 - Hardy, J., Powell, H., & MacRury, I. (2018). *The advertising handbook*. London; New York: Routledge, Taylor et Francis Group. - Abbasi, Ahmed, Yili Zhou, Shasha Deng, and Pengzhu Zhang (2018), "Text Analytics to Support Sense-Making in Social Media: A Language-Action Perspective," MIS Quarterly, 42 (2), 427–464.
4- We use the Content Management Platform (CMP) to select the best creative assets online.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) *Understanding Programmatic Creative: The Role of AI*, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421

| 5- We use AI to create tags for creative elements. | - Abbasi, Ahmed, Yili Zhou, Shasha Deng, and Pengzhu Zhang (2018), *"Text Analytics to Support Sense-Making in Social Media: A Language-Action Perspective,"* MIS Quarterly, 42 (2), 427–464.

- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) *Understanding Programmatic Creative: The Role of AI*, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421

- Lennon, Rob (2017), "Programmatic Creative vs. Dynamic Creative Optimization (DCO)," Thunder, April 15, https://www.makethunder. com/programmatic-creative-vs-dynamic-creative-optimization-dco/.

-Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 |
| 6- We use Programmatic Advertising Creation (PAC) to fine-tune the ad content | - Kietzmann, Jan & Paschen, Jeannette & Treen, Emily. (2018). *Artificial Intelligence in Advertising: How Marketers Can Leverage Artificial Intelligence Along the* |

quality on the fly.	*Consumer Journey.* Journal of Advertising Research. 58. 263-267. 10.2501/JAR-2018-035. - Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) *Understanding Programmatic Creative: The Role of AI,* Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421
7- We use AI to design digital ads.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Lennon, Rob (2017), "Programmatic Creative vs. Dynamic Creative Optimization (DCO)," Thunder, April 15, https://www.makethunder. com/programmatic-creative-vs-dynamic-creative-optimization-dco/.
8- We use AI to create the ad copy.	- Hardy, J., Powell, H., & MacRury, I. (2018). *The advertising handbook*. London; New York: Routledge, Taylor et Francis Group.

	- Lennon, Rob (2017), "Programmatic Creative vs. Dynamic Creative Optimization (DCO)," Thunder, April 15, https://www.makethunder. com/programmatic-creative-vs-dynamic-creative-optimization-dco/. - Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421
9- We apply AI to help us quantify the effectiveness of creative ad elements.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421

Construct 3: Utilization of Artificial Intelligence in media planning and buying

The following table shows the perceptual statements of the items used to operationalize the third construct and shows the source of each item

Item	Source
1- We use Programmatic Media buying to boost efficiency and transparency between advertisers and publishers.	- Affectiva Media Analytics. (n.d.). Retrievedfrom:https://www.affectiva.com/product/affdex-for-market-research/ - Malthouse, Edward C., Ewa Maslowska, and Judy U. Franks (2018), "Understanding Programmatic TV Advertising," International Journal of Advertising, 37 (5), 769–784. - Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421
2- We use AI to forecast the Click-Through-Rate (CTR) of an ad impression.	- Graham, K. (2019, September 19). What Is Real-Time Bidding? RTB Advertising Technology Explained (2019). Retrieved from https://www.monetizemore.com/blog/real-time-bidding-rtb-explained/.
3- We apply Machine	- Affectiva Media Analytics. (n.d.). Retrieved

Learning and Deep Learning to understand digital consumer media consumption.	from:https://www.affectiva.com/product/affdex-for-market-research/ - Malthouse, Edward C., Ewa Maslowska, and Judy U. Franks (2018), "Understanding Programmatic TV Advertising," International Journal of Advertising, 37 (5), 769–784.
4- We use Facebook Ads Manager and/or Google Ads to execute media planning.	- Malthouse, Edward C., Ewa Maslowska, and Judy U. Franks (2018), "Understanding Programmatic TV Advertising," International Journal of Advertising, 37 (5), 769–784.
5- Our agency utilizes AI in the automated dynamic media planning and buying phase.	- Malthouse, Edward C., Ewa Maslowska, and Judy U. Franks (2018), "Understanding Programmatic TV Advertising," International Journal of Advertising, 37 (5), 769–784. - Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421

Construct 4: Utilization of Artificial Intelligence in Ad monitoring and evaluation

The following table shows the perceptual statements of the items used to operationalize the fourth construct and shows the source of each item.

Item	Source
1- We use Machine Learning (ML) and Deep learning (DL) to obtain real-time online consumer feedback on various digital ad formats (text, banner, and video).	- Kietzmann, Jan & Paschen, Jeannette & Treen, Emily. (2018). *Artificial Intelligence in Advertising: How Marketers Can Leverage Artificial Intelligence Along the Consumer Journey.* Journal of Advertising Research. 58. 263-267. 10.2501/JAR-2018-035. - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
2- We use ML and DL to assess consumer feedback in media planning and buying.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122

3- We use ML and DL to help us assess consumer feedback to use ad content.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
4- We apply ML and DL in pretesting an ad.	- Lennon, Rob (2017), "Programmatic Creative vs. Dynamic Creative Optimization (DCO)," Thunder, April 15, https://www.makethunder. com/programmatic-creative-vs-dynamic-creative-optimization-dco/.
5- We apply ML and DL in measuring the independent effect of creative elements on the target audience.	- Lennon, Rob (2017), "Programmatic Creative vs. Dynamic Creative Optimization (DCO)," Thunder, April 15, https://www.makethunder. com/programmatic-creative-vs-dynamic-creative-optimization-dco/. - Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of

	Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122 - Rauber, Paulo E., Samuel G. Fadel, Alexandre X. Falc~ao, and Alexandru C. Telea (2016), "Visualizing the Hidden Activity of Artificial Neural Networks," IEEE Transactions on Visualization and Computer Graphics, 23 (1), 101–110. - Affectiva Media Analytics. (n.d.). Retrieved from:https://www.affectiva.com/product/affdex-for-market-research/
6- We use AI to monitor campaign performance.	- Affectiva Media Analytics. (n.d.). Retrieved from:https://www.affectiva.com/product/affdex-for-market-research/ - Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
7- Testing ads with AI technology allows us to	- Affectiva Media Analytics. (n.d.). Retrieved from:https://www.affectiva.com/product/affdex-for-market-

assess online consumers' real-time responses.	research/ - Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122

Construct 5: Effectiveness of employing AI in online advertising

The following table shows the perceptual statements of the items used to operationalize the

first construct and shows the source of each item

Item	Source
1- We become more cost-effective after applying AI tools.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
2- We become more time-efficient after applying AI tools.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of

	Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
3- We become more responsive to changing consumer preferences.	- Gang Chen, Peihong Xie, Jing Dong & Tianfu Wang (2019) Understanding Programmatic Creative: The Role of AI, Journal of Advertising, 48:4, 347-355, DOI: 10.1080/00913367.2019.1654421 - Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
4- We become able to create measurable campaigns.	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122
5- We become more able to meet campaign objectives.	- Xuebing Qin & Zhibin Jiang (2019) The Impact of AI on the Advertising Process: The Chinese Experience, Journal of Advertising, 48:4, 338-346, DOI: 10.1080/00913367.2019.1652122

2.3 Elaboration of the Conceptual Model
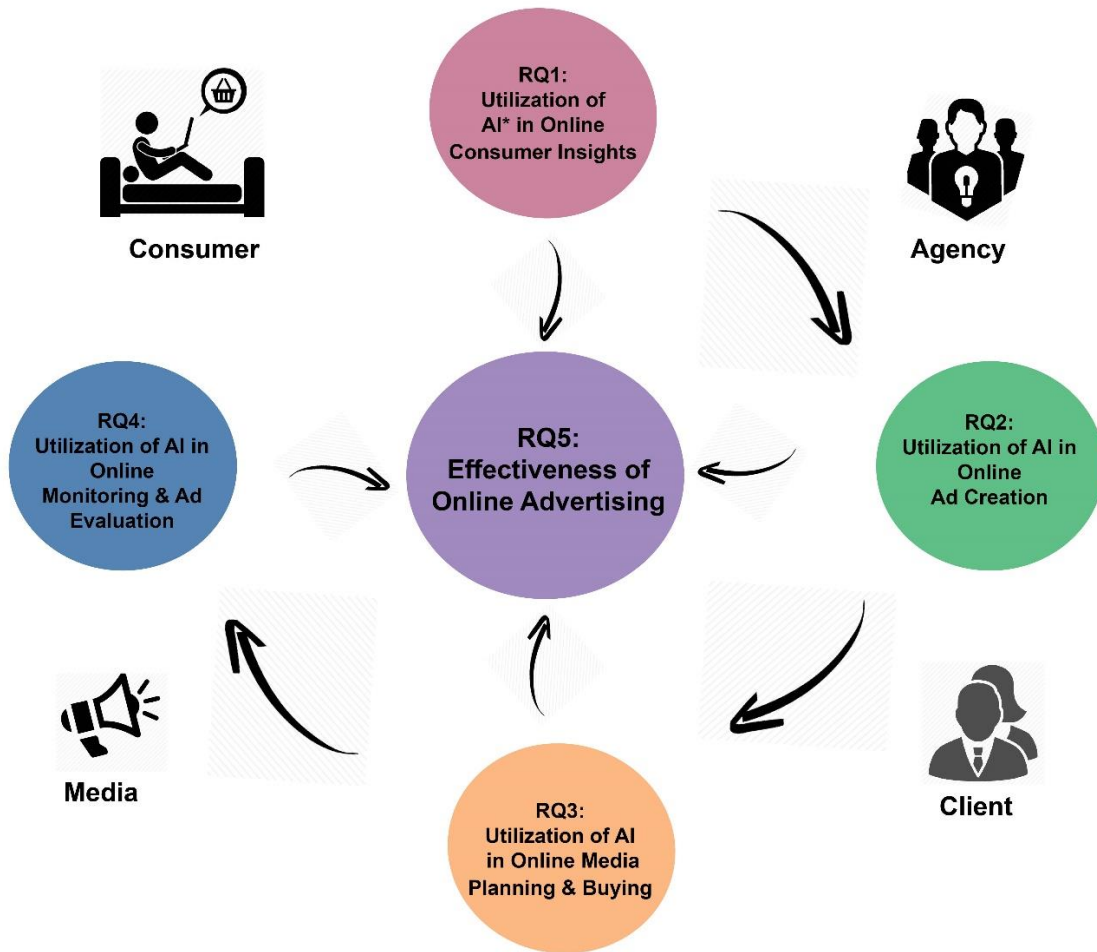
Figure 4: Process Model of AI Utilization in Online Advertising and its Perceived Effectiveness

*__Artificial Intelligence (AI)__ mainly mains Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), Natural Language Generation (NLG), and any other application that qualify as AI algorithms.
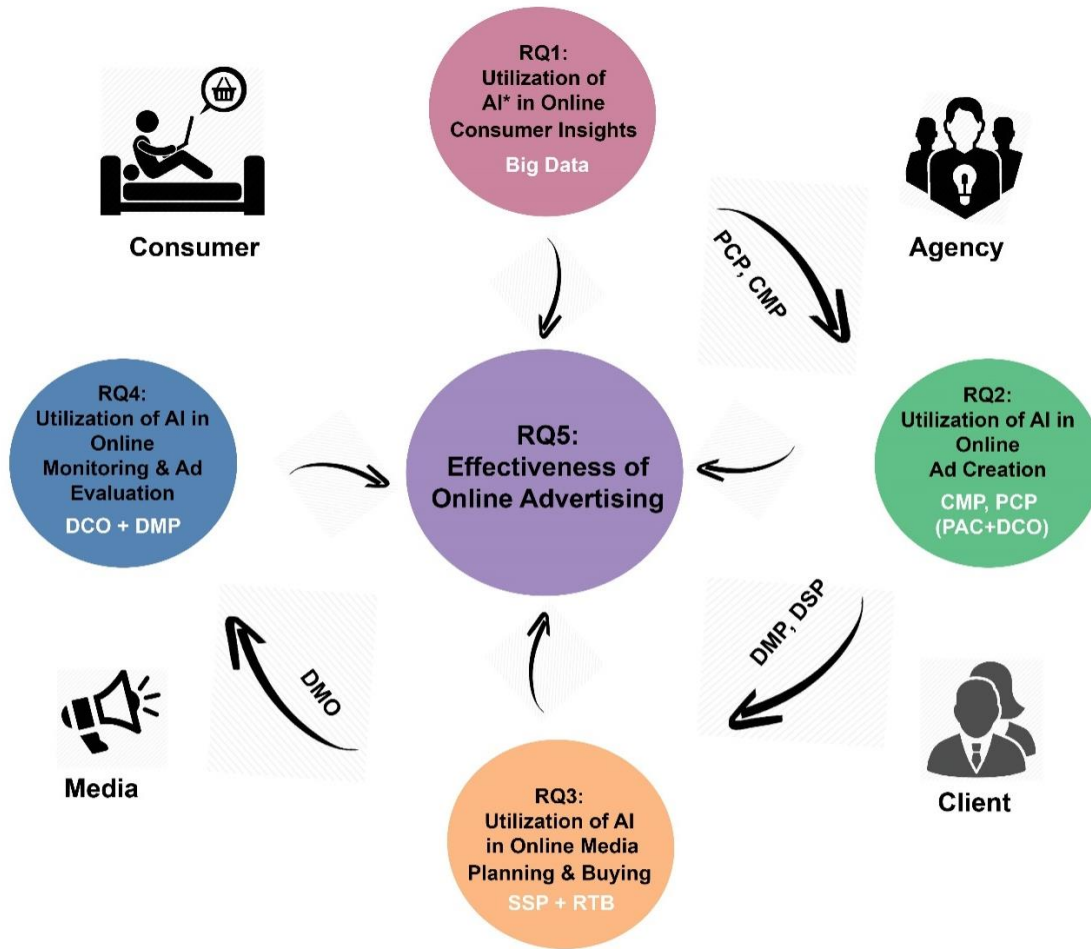
Figure 5: Process Model of AI Utilization in Online Advertising and its Effectiveness (Tools Used)

***Artificial Intelligence** (AI) mainly mains Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), Natural Language Generation (NLG), and any other application that qualify as AI algorithms.

PCP= Programmatic Creative Platform
CMP= Content Management Platform
PAC= Programmatic Advertising Creation
DCO= Dynamic Creative Optimization
DSP= Demand Side Platform
SSP= Supply Side Platform
RTB= Real-time Bidding
DMO= Dynamic Media Optimization

The first step in the *Process Model for Utilization of AI in Online Advertising and its Effectiveness* is the **Utilization of AI in Online Insights Discovery (RQ1).** Advertising agencies conduct full-fledged advertising research as it aids in improving the position of brands,

predicting likely issues, monitoring progress, and limiting the chances of failures.There are multiple ways where AI can be integrated into the real-time gathering and processing of online consumer's insights. Consequently, it deeply explores and mines big data such as online lifestyle and consumer demographics, psychographics and behavioral trajectories to create a combination of tags for each one. Hence, the model assumes that AI is helpful for advertisers to gather and process accurate research and insights about online consumers. This utilization helps online advertisers to make efficient audience segmentation and targeting.

The second step in the model is **the Utilization of AI in Ad Creation (RQ2).** It assumes that AI facilitates the creative ad process by boosting ads content quality and fine-tuning the effectiveness of an ad on the go. With the aid of AI algorithms for ad creation, advertisers can automatically tailor ad content at a wide scale, innear real-time. The quality standard of creating online ad content requires advertisers to adopt the Content Management Platform (CMP) and Programmatic Creative Platform (PCP) to select and manage content big data. By utilizing AI technology, CMP organizes a big number of creative raw materials that PCP has. Not only does it assemble creative elements from various sources, but also CMP creates tags for creative elements to be used in PCP. The latter consists of Programmatic Ad Creation (PAC) and Dynamic Creative Optimization (DCO). As for the PAC, it optimizes the effectiveness of the ad on the go and improves its quality for the next round. As for the DCO, it enables advertisers to test the real-time performance of many variations of ads across many contexts at the same time. In other words, DCO judges various elements of creative content, the timing of ad exposure, and target audience simultaneously. CMP and PCP are terms mentioned in the Programmatic Advertising Process by Chen et al (2019). It is worth-mentioning that creative elements of an ad

mean the layout, the copywriting, the entire artwork, call-to-action of the online ad, its description, etc.

The third step **is the Utilization of AI inMedia Planning and Buying (RQ3).** It is part of the "Programmatic advertising" where it occurs in the Ad tech ecosystem. Programmatic advertising consists of the *Data Management Platform (DMP), Demand Side Platform (DSP) and Supply Side Platform (SSP).* AI is a pillar in the media's online planning and buying ecosystem. As for the DMP, advertisers use AI technology to pool billions of personalized users' big data to evaluate each potential ad impression and strategically bid for it. As for DSP, this technique is the essence of AI-enabled programmatic buying from the advertiser's side. It aids digital advertisers to strategically target online users and do real-time bidding (RTB) to buy impressions. "To complete the auction in milliseconds and generate revenue for advertisers, DSP needs to predict the click-through rate (CTR) of an advertisement impression" (Chen et al, 2019). Hence, "DSP takes advantage of machine learning algorithms, such as neural networks, to uncover hidden layers of tags by computing the weighted combinations of tags" (Rauber et al. 2016). As for the Supply Side Platform (SSP), it is a technology from the online publisher's side. It manages the publisher's total inventory of ad space, optimizes selling the ad impressions, and receives revenues. SSP set the bidding range and place content in real-time. Real-Time Bidding (RTB) is a mediation between DSP and SSP. It is used to complete DSP transactions. Enabled by AI technology, RTB is an "auction setting where ad impressions are sold and bought, and transactions take place in a blink of an eye." (Graham, 2019)

The fourth step in the *AI Online Advertising Process Model* is the **Utilization of AI inAd Evaluation (RQ4).** The impact of ads is measured with AI technologies to collect real-time feedback of online big data from various digital channels, and a "smart analysis" is run to compare the ad influence vs. its initial planned ad. objectives. Subsequently, adjustments are made not only to targets of media planning and buying but also made to the ad content near real-time. AI technologies make the "seconds optimization possible by shortening the gap between the impact evaluation and optimization to a matter of seconds; therefore, the integration and synchronization of impact evaluation and responsive improvement are realized" (Qin and Jiang, 2019). The literature supports that automated creativity facilitates testing, monitoring of campaign performance, and "real-time refinement" of ads. Hence, AI technology embedded in monitoring online ad impact processes triggers higher effectiveness rates. AI technology is used to pretest an ad as well. It can be applied to measure the independent effect of creative elements mixed on the target audience. As a result, in this step, Dynamic Creative Optimization (DCO) is key. As mentioned in the Ad Creation step, DCO, facilitated by AI technologies, is a vigorous tool that enables advertisers to judge elements of creative content, the timing of ad exposure, and target audience at the same time. In addition, the Data Management Platform (DMP), mentioned in the media planning and buying step, is used in the evaluation as well. Through AI technology, DMP allows online advertisers to use massive amounts of online consumer's big data and evaluate each potential ad impact and strategically bid for it in a personalized manner.

After explaining each step separately, it is crucial to state the connection between them, where AI technology plays a pivotal role, as well. **RQ1** needs AI technology embedded in the Programmatic Creative Platform (PCP) and Content Management Platform (CMP) to digest the

near real-time gathered and processed consumer insights and move it to **RQ2.** After the ad creation occurs, the AI-enabled Data Management Platform (DMP) and Demand Side Platform (DSP) mediate the online ad from the client's side to the publisher's side**.** This is where media planning and programmatic buying occur in the ad tech ecosystem **(RQ3)**. Consequently, the ad and/or campaign needs to be evaluated and/or monitored; hence AI enters here as well through Dynamic Media Optimization (DMO). The latter is a new term suggestedshowing the AI embedded platform mediation between **(RQ3 and RQ4)** where near real-time adjustments are made to media planning and buying after the dynamic evaluation for online ads and/or campaigns.

       Between Q2 and Q4, there is the AI-enabled Dynamic Creative Optimization (DCO) which constitutes a mediation that goes back and forth. After creating the ad, the online advertiser needs to assess instantaneously the impact of many variations of the creative mix, the timing of ad exposure, on various online users in a personalized manner. Thus, this step occurs iteratively to fine-tune the ad to maximize its effectiveness.

       Additionally, the model explores if the utilization of AI in any of the online advertising steps promotes the overall perceived advertising online advertising effectiveness. The model of the study tests each stage separately (each as Independent Variable) and its impact on the overall effectiveness of online (RQ5) (Dependent variable). In other words, it assesses the relationships between **RQ1→ RQ5, RQ2→ RQ5, RQ3→ RQ5, RQ4→ RQ5.**

       The online advertising process exists and thrives within an ecosystem that includes several players and stakeholders. Four, particularly, have a critical influence on the process; the

online consumer, the online advertising agency, the online client (owner of the advertised brand), and the online media platforms whether paid owned, or earned. Other stakeholders that are not addressed in this model include regulators, influencers, and bystanders who are exposed to the online ads though not directly concerned. These and other stakeholders could voice opinions and observations that may impact the online campaign and make it go viral, for better or for worse.

The online **consumer**'s digital touchpoints in various online platforms pump big data that trigger Online Insights Discovery. Between stage 1 (RQ1) and stage 2 (RQ2), the **agency** is the key entity that processes the results of online consumer's insights to create ads. After Stage 2 (RQ2), a **client** starts to sell the ad and/or campaign to online media planners and buyers, looking for ad impressions to skyrocket. Between Stage 3 (RQ3) and Stage 4 (RQ4), online **media** is the main entity where publishers place ads in multiple online platforms after setting the bidding range in a dynamic ad tech ecosystem. Then, the cycle reaches again to square one, the online consumer. Iteration is key in this cycle.

2.4 The Contributions of the Model

The *AI Online Advertising Process Model* adds to our understanding of the phenomenon with at least four significant contributions.

First, the study redefined the 4 main stages of developing an online advertising process in more concrete terms. Moreover, it developed the multi-item scale to measure the utilization of AI at each stage of online advertising with very high reliability as reported later in this paper.

Second, the model also introduced the impact of AI utilization on the overall effectiveness of online advertising and developed a reliable multi-item scale to measure it.

Third, the model identified and integrated the four major players in the AI-enabled online advertising ecosystem namely the Consumer, Client, Agency, and Media. The impact and influence of those four players and possiblyothers such as regulators and bystanders is not operationalized or measured in this research. It can be a wide-open area for future scholars to study the interplay of these four entities in the AI-enabled online advertising process using interdisciplinary methods such as system dynamics, stakeholder mapping.

Chapter 3: Methodology

The methodology of this study adopted both a qualitative and quantitative approach to data collection. This triangulation enhances the credibility of the research study and leads to a more comprehensive understanding of the utilization of AI in online advertising and its effectiveness. (Salkind, 2010)
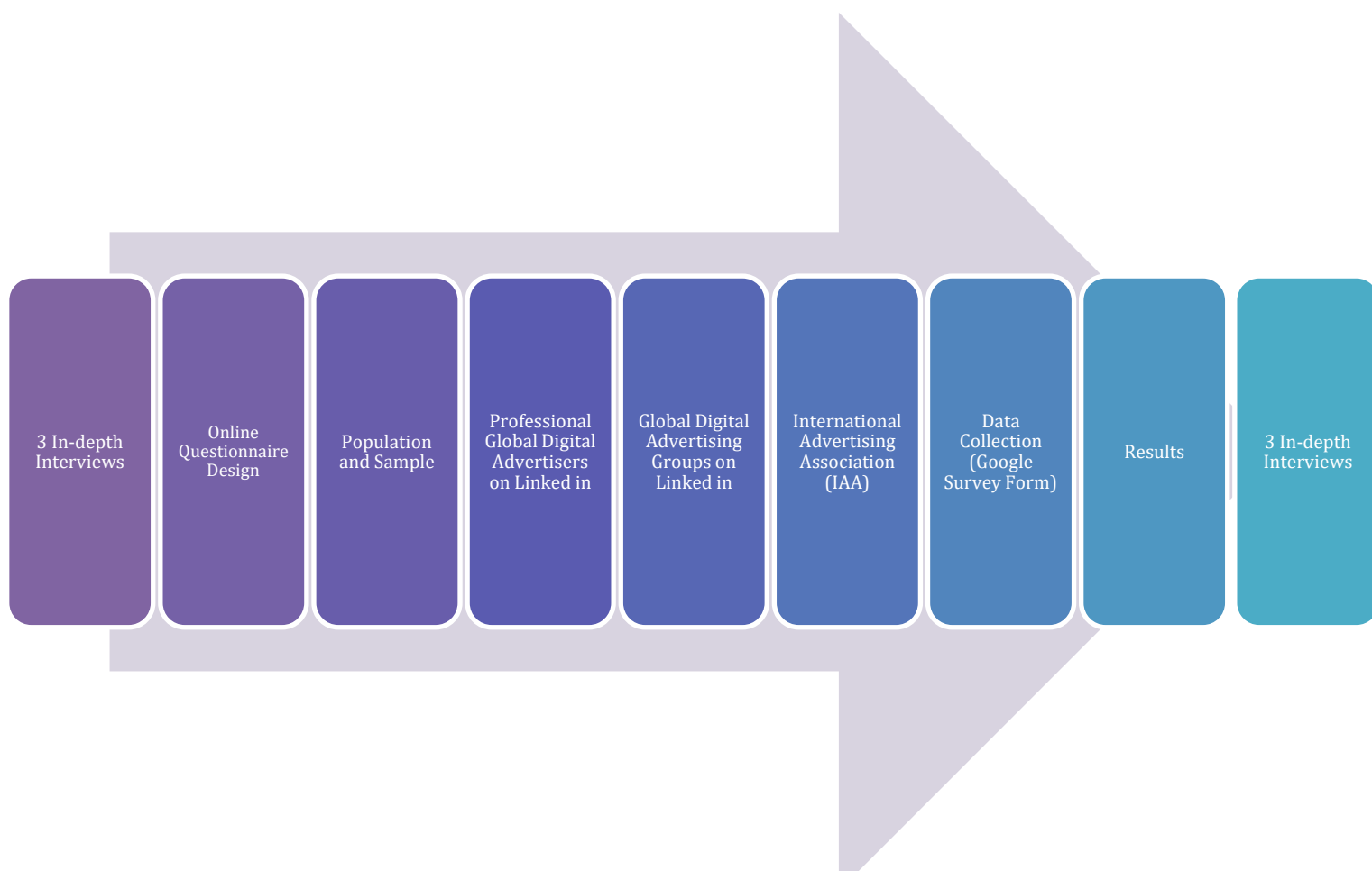
Figure 6: Methodology of the Study

3.1 In-Depth Interviews

The methodology of this study started with qualitative research by asking in-depth discussions with three professionals in online advertising. Their experience and knowledge augmented the researcher's understanding of the application of AI in digital advertising and improving the questionnaire design.

The first in-depth discussion was with Mr. Mostafa Zaher who is a software engineer who was part of the team that built the website and the mobile application powered by Affectiva's AI models. He also worked in Instascaler; an automated advertising platform for anyone that "automates traffic acquisition for any website by automating campaign creation, optimization and A/B testing across hundreds of marketing platforms. It gets you traffic from multiple sources including Google Search, Display, Facebook, Amazon, Bing, and hundreds of others with zero manual effort." (Instascaler, 2020). The interviewee was leading a team of engineers in charge of building the website and dashboards that are used by customers to form big AI-powered digital marketing campaigns. His knowledge was valuable in the researcher's understanding, on a practical level, the importance of AI in the digital advertising process.

The second interviewee is Mr. Fawzy El Mawy, the founder and CEO of Snaptiks, which is an agency that offers full-fledged digital marketing and advertising solutions. With a 14-year-of-experience in digital marketing and mobile advertising, the interviewee helps the researcher in grasping more the mechanism of digital advertising, particularly the dynamic creative and digital media planning and buying, using AI technology in Facebook and Google.

The third in-depth discussion was with Dr. Sherif Makhlouf, a digital strategy consultant, a serial digital entrepreneur, and an adjunct professor of Digital strategy at the American University in Cairo. He has "extensive experience in digital management, online marketing, strategy consultant, and eCommerce. He has managed various successful digital businesses including Jumia.com, Afar.com, and enigmashopping.com (Brand yourself.com, 2020). His insights helped improve the questionnaire design.

Besides, there were three more in-depth interviews post data collection to discuss insights with experts in the field.Hazem Bahaa is the Head of the Global Marketing Communication Team in SWVL. He had global exposure with his online campaigns as well as his team starts to embrace Machine Learning in SWVL growth ads. We had another in-depth interview Bassem Abdel Ghani- Marketing Director for Chocolate and Biscuits in MENAP at Mondelez. His experience as an FMCG client with digital advertising agencies enriches the discussion and findings of the study. Finally, an informative discussion was done with Dr. Ahmed Sayed who is the Practice Manager in Germany for Emerging Technologies and Intelligence Platforms at Amazon Web Services (AWS). His technical experience in the AI field promoted understanding for certain findings of the study.

3.2 Online Survey

After in-depth discussions with 15+ years of experienced professionals in online advertising, a

quantitative approach is applied by distributing an online google form survey on a global scale.

3.2.1 Population

The population of this research includes all global professionals in online/digital advertising.

Professional online advertisers can have experience on the client-side or the agency side or both.

They may use Artificial Intelligence in one or all of 4 online advertising steps.

3.2.2 Sampling Frame

First, Linkedin is considered the leading social network for professionals, entrepreneurs,

recruiters, hiring managers, and opinion leaders. Consequently, it was the first step in the

sampling frame of the study as manyof our target audience is on Linkedin in two types. There are

individual professionals and groups. Step one was that the researcher began with all individual

global professionals working in the field of online/digital advertising, by searching from the

premium account. Then, the researcher sent LinkedIn messages to them which included a short

introduction about the purpose of the study, attaching the questionnaire. Targeting individual

professionals on Linkedin was the most successful and effective approach in getting answers

from a global perspective.

Step two was searching on professional groups that pertain to global digital advertising such as

Digital Advertising and Marketing, Digital Advertising Operations, Digital Advertising, and

Digital Media Professionals, SOLUTIONators, 212NYC- NewYork's Digital Advertising

Community, Indonesia Social Media, Digital Advertising and Mobile Technology Enthusiast,

Digital, Data, and Adtech professionals in the advertising, Media and Entertainment, and many

other groups. The researcher sent messages to the admins of those groups to help in distributing

the questionnaire on its group members. Unfortunately, their responses were either apologetic or

no response at all. Thus, online advertising groups on Linkedin did not pay off.

To boost the global reach of the questionnaire, the researcher additionally, targeted the

International Advertising Association (IAA). It is a one-of-a-kind "strategic partnership that

champions the common interests of all the disciplines across the full spectrum of marketing

communications - from advertisers to media companies to agencies to direct marketing firms - as

well as individual practitioners." (IAA, 2020). The researcher sent emails to the presidents of all

chapters in IAA. Emails included a small introduction to the study. Attaching the questionnaire,

the researcher asked for kind support in distributing it. IAA has an enormous global footprint that

includes France, Italy, United Kingdom, Austria, Poland, Malaysia, South Korea, Japan, Nepal,

India, Iran, Turkey, Saudi Arabia, Kuwait, UAE, Egypt, and many other countries. However, few

responded as most of the responses were either apologetic or no response due to the global

coronavirus crisis (*See figure 7 and 8*)

Lidija Savić
to me ▼

Fri, Apr 3, 10:35 AM (9 days ago)

Dear Nouran,

I hope you are well.

Thank you for your mail and your Survey Link.
Unfortunately, the current situation (with the virus COVID-19) is such that the chapter activities are minimal and we send the members only the most important notifications.

Good Luck!

Have a nice day!

Best regards,
Lidija Savić
IAA Officer

Bulevar Zorana Đinđića 144
11077 Belgrade, Serbia
M +381 60 53 00 494
E lidija.savic@iaa.rs

Figure 8: Sample of Apologetic Responses (1)- Serbia

Dear Nouran,

Thank you for your email you addressed to Walter. He asked me to pass on the survey to our members, what I did meanwhile. Please expect that due to the special situation people have to cope with different topics and problems. So I kindly ask for your understanding that it might be, that not all of them won´t take part in the survey.

Wish you all the best,

Gabi

Gabriela Stimpfl-Abele

Executive Director

1060 Wien, Gumpendorfer Straße 19 - 21

Mob: +43 664 915 90 19

Figure 7: Sample of Apologetic Responses (2)

3.3.3 Sampling Unit

In this study, the sampling unit is the professionals who work in the online/digital advertising field on a global scale. He/she works in online insights and research, creative direction, copywriting, art direction, media planning, and media buying. Moreover, the research addressed the top management of online advertising agencies; since they are typically involved in all phases of developing and producing online advertising campaigns underthe supervision and quality assurance; particularly with crucial clients. All of these professionals are from the agency side. On the client-side, we targeted advertising managers and/or specialists, corporate communication managers, online advertising specialists, marketing communication managers, and specialists. The questionnaire asks the respondents upfront to identify if they were working on the client-side or the agency side.

3.3.4 Sample Size

The researcher started the data collection with a target sample size of 250+. Due to the Coronavirus crisis, many key respondents (such as IAA and Linkedin Groups) who were supposed to distribute our survey to members in their network, apologized as questionnaire distribution was a little bit challenging. *(Check figures 7 and 8)*

However, after several follow-ups, **a sample size of 60 respondents was accomplished.** Given the exploratory nature of this research, this sample can be considered adequate to assess the validity of the research questions on hand. However, as mentioned in details later in the results section, there is high reliability and signifigance in the study's findings.

Despite the fact the sample was self-selected, it can be considered **a probability sample**, given the global distribution of the survey without limiting it geographically or otherwise. Pretty much most of the population was attempted in our data collection approach.

In a probability sample, every unit in the population must have a chance of being selected (Malhotra, N.K, 2020).

3.4 Purpose of Analysis

First, the study aims to assess the utilization of Artificial Intelligence in the four key stages of online advertising (RQ1, RQ2, RQ3, and RQ4). In other words, the study attempts to test the 5 RQs, (mentioned clearly in Table 2).

Second, it assesses the correlation of utilization of AI in each stage to the usage of AI in the next stage. For example, Is the utilization of AI in the online consumer insights discovery stage (RQ1) is correlated to the utilization of AI in the online ad creation stage (RQ2)? The same goes for the correlation between RQ2 → RQ3, and RQ3→ RQ4.

Third, the research additionally explores if the utilization of AI in any of the online advertising steps correlates to the increase in the overall online advertising effectiveness. The model of the study suggests testing each step separately (each as Independent Variable) and its impact on the overall effectiveness of online advertising (Q5) (Dependent variable). In other words, the study tests the relation of RQ1→ RQ5, RQ2→ RQ5, RQ3→ RQ5, RQ4→ RQ5.

3.5 Data Analysis

After data was collected on google form, descriptive statistics were created using the SPSS

version 24, with support from the Research Center at AUC.

First, the study analyzed the frequencies of the 60 responses. Second, the reliability of the study

was calculated. Then, the regression analysis was designed for two purposes. The first aim is to

explore the connection between each stage in online advertising with the next stage. For

example, the research attempts to know whether the utilization of AI in the online consumer

discovery phase (RQ1) leads to the utilization of AI in the Ad creation phase (RQ2), or these are

two separate phases in online advertising. The same goes for RQ2 → RQ3, RQ3→ RQ4. The

second aim for regression is to test the connection between each phase in online advertising

(RQ1, RQ2, RQ3, RQ4) to the overall effectiveness of online advertising (RQ5).

Chapter 4: Results and Findings

In this section, results for each RQ are represented. As mentioned earlier *in table 2*, the study posits 5 RQs that aim to test five constructs. There is a Likert scale designed to test each RQ through various propositions about the construct measured.Results for each RQ are shown through its reliability and descriptive statistics (table of frequencies).

However, before exploring the results of each RQ. There are 2 classification questions at the beginning of the questionnaire that allows the researcher to know the working experience background of the survey respondent. First, in a close-ended question, the researcher asks whether working experience in online advertising mainly comes from agency-side or client-side or both.
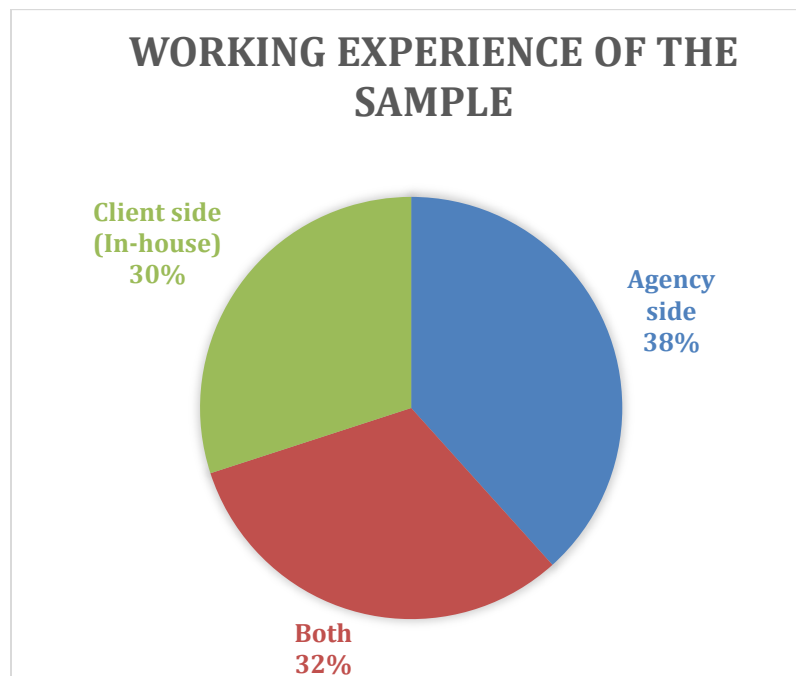
Figure 9: Results of Working Experience of the Sample (Percentage)

More than 50% of the digital advertisers in the sample are from the agency side. If the respondent chose "Both", the research would consider it as more of an agency background.
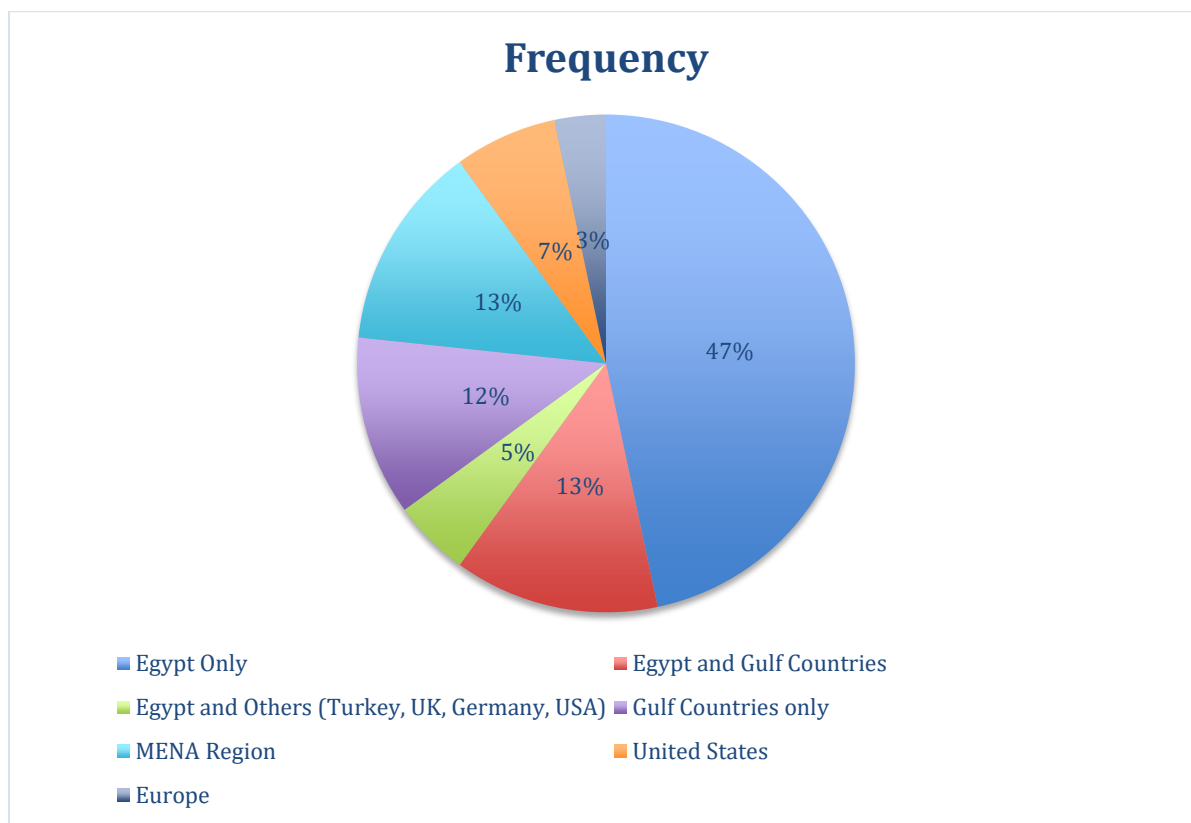
Figure 10: Results of Countries Participated in the Survey

Then, the researcher asks about the country where the survey participant (digital advertiser) works in. This data is crucial as our survey is distributed worldwide. This is an open-ended question. The following pie chart elaborates on the results.

4.1 Results of Research Questions

In this section, you are represented with 5 tables that combine the results of five research questions (Five constructs tested in the online survey) with their descriptive statistics and their reliability. The sample size (N) is 60 respondents.

For example, table 3 tackles the results of the utilization of AI in gathering online consumer insights (1st construct). The table shows each question in the survey from 3 angles; its reliability, its mean relative to the other propositions tested in the Likert scale, and finally the percentage of agreement/ disagreement with the tested proposition. The latter angle is crucial as it shows the opinions of the digital advertisers in the sample towards the mentioned propositions on the Likert scale.

Then, the next four tables, in this section, move to the following constructs which are the utilization of AI in Ad creation (2nd construct), utilization of AI in media planning and buying (3rd construct) and utilization of AI in monitoring and ad evaluation (4th construct). The survey also tested the effectiveness of using AI in online advertising (5th construct). The results of each construct are shown from the same three angles as 1st construct, respectively.

The first two findings of the results are shown in Table S. It shows the means of the five research questions. That utilization of AI in media planning and buying (RQ3) and the effectiveness of AI in online advertising (RQ5) are the highest two means. This indicates that digital advertisers agree first that AI is used in media planning and buying. Additionally, they do agree that applying AI tools increases the effectiveness of online advertising processes.

Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
RQ1	60	1	5	3.24	1.08
RQ2	60	1	5	2.74	1.11
RQ3	60	1.8	5	3.61	0.95
RQ4	60	1	5	3.05	1.24
RQ5	60	1	5	3.68	0.91

Reliability Statistics

Generally, Reliability implies consistency and stability in results of the study. It is the ability for research findings to be repeatable. There are various tools to measure reliability. This study used Cronbach's alpha that measures internal reliability for tests with multiple possible answers. Cortina says "above 0.70 is acceptable, 0.80 or greater is preferred." (Cortina,1993) and the higher the better. Successfully, reliability of this study is highly significant. Despite the small sample size, Cronbach's alpha is relatively high for each item due the following three reasons. First, there was a mutual lack of strong and updated knowledge in AI in the sample. Second, across the sample, there was no vivid application of AI in the online advertising. Third, all of the sample aware of the importance of AI and its effectiveness in online advertising process. Given that three reasons, there was common directions and opinions in their answers leading to high reliability.

4.1.1 Results of RQ1: What is the utilization of AI in consumer insights discovery in the online advertising process?

(N=60)

Table 3: Descriptive Results of AI Utilization in Consumer Insights Stage (RQ1)

Reliability= .900 Question	Strongly Disagree % (5)	Disagree % (4)	Neutral % (3)	Agree % (2)	Strongly Agree % (1)	Average	Cronbach's Alpha if item is deleted
1- We acquire and use real-time big data to reach consumer insights	6.7	3.3	23.3	30	36.7	3.867	.901
2- We apply Natural Language Processing (NLP) to analyze and reveal online consumer attitudes and preferences.	25	8.3	28.3	23.3	15	2.950	.879
3- We use Emotion AI software to understand consumer emotional engagement in various digital ads.	28.3	15	20	18.3	18.3	2.833	.894
4- We use Machine Learning (ML) to make precise forecasts about online consumers' purchase intentions	21.7	15	13.3	23.3	26.7	3.183	.888
5- We use AI to create strong lead profiles.	18.3	13.3	25	25	18.3	3.117	.879
6- We use AI to make efficient audience segmentation and/ or targeting.	13.3	10	21.7	26.7	28.3	3.467	.883
7- Overall, we collect and analyze big data of online consumers efficiently with AI technology.	13.3	8.3	33.3	26.7	18.3	3.283	.874

In the first question, the results indicate that more than half of the respondents (66.7%) highly

agree with the notion of using real-time big data to know online consumer insights. In the second

question, digital advertisers are a little bit diversified in their opinions about applying NLP (an

AI technique) to analyze and reveal online consumers' attitudes and preferences. The highest

percentage (28.3%) falls in the neutral area. 25% of the respondents strongly disagree with using

NLP in revealing online consumer attitudes. However, 23.3% of them agree. These are the

highest percentages in the answers to the second question. Yet, from a wider angle, there is a

direction towards agreement on using NLP to analyze and reveal online consumer's purchase

intentions. 38.3% of the respondents agree/strongly agree. In the third question, as for using

Emotion AI to understand consumer emotional engagement with online ads, the highest

percentage goes to that 28.3% of respondents strongly disagree. By considering the percentage of

"disagree", we can deduce that the majority of the sample (43.3%) is more inclined towards the

disagreement direction. It is good to include the second-highest percentage in the results of this

question which goes for respondents who agree with a percentage of 36.6%.

In the fourth question, half of the respondents (on average 50% of them) agree that they use ML

to make precise forecasts about online consumers' purchase intentions. However, there is an

indication that 36.7% of the respondents see the total opposite. They are more inclined to the

direction of disagreement that ML is used in the advertising process to predict the online

consumers' purchase intentions.

As for the fifth question, 43.3% of the respondents perceive that AI is used in creating strong

lead profiles. However, there is still a direction to disagreement as 31.6% of the respondents

don't perceive AI as a good tool to create strong lead profiles.

In the sixth question, more than half of the sample is inclined to support the fact of using AI in audience segmentation and/or targeting. 55% of the respondents agree with the proposition. Only 23.3% disagree with the fact of using AI in audience segmentation/ targeting.

The last question was designed to get an overall and generic opinion about AI utilization in collecting and analyzing consumer insights. 45% of the respondents are more inclined towards an agreement with the current concept. The following highest percentage (26.6%) goes to being neutral. Though it is a low percentage, there is still 26.6% of the sample who disagree. Overall, the highest percentage here goes to the digital advertisers who agree on using AI in their consumer insights and research stage.

4.4.2 Results for RQ2: What is the utilization of AI in the online ad creation?

Table 4: Descriptive Results of Utilization of AI in Ad Creation Stage (RQ2)

Reliability	0.922	(N=60)					
Question	Strongly disagree % (1)	Disagree % (2)	Neutral % (3)	Agree % (4)	Strongly Agree % (5)	Average	Cronbach's alpha if item deleted
1- We apply AI technology to tailor ad texts and images based on consumer's demographics, psychographics and/or online behavior.	18.30%	16.70%	16.70%	28.30%	20%	3.15	0.914
2- We fully integrate AI into the creative department.	31.70%	21.70%	20%	11.70%	15%	2.567	0.908
3- We use AI to judge elements of creative content	31.70%	20%	26.70%	11.70%	10%	2.483	0.906
4- We use Content Management Platform (CMP) to select the best creative assets online.	28.30%	15%	15%	21.70%	20%	2.9	0.926
5- We use AI to create tags for creative elements.	25%	18.30%	33.30%	10%	13.30%	2.683	0.915
6- We use Programmatic Advertising Creation (PAC) to fine tune the ad content quality on the fly.	20%	21.70%	16.70%	18.30%	23.30%	3.033	0.924
7- We use AI to design digital ads.	33.30%	16.70%	23.30%	13.30%	13.30%	2.567	0.904
8- We use AI to create the ad copy.	36.70%	20%	21.70%	10%	11.70%	2.4	0.911
9- We apply AI to help us quantify the effectiveness of creative ad elements.	25%	20%	13.30%	23.30%	18.30%	2.9	0.911

In the first question, 48% of the sample agree that they apply AI to tailor ad texts and images based on the online consumer's demographics, psychographics, and online behavior. However, there is 35% of the sample are more inclined to the disagreement with this proposition. In the second question, more than half of the sample disagree that they fully integrate AI into the creative department. The percentage of disagreement in the sample is 53.4%. On the other hand, there is a 26.7% agreement on that proposition. In the third question, there is an obvious direction towards disagreeing with using AI to judge elements of creative content such as copywriting, art direction, design, images...etc. More than 51% of the sample disagree. 26.7% of the sample are neutral and 21.7% agree with the proposition.

In the fourth question, there is a bipolar direction in its results. 43% of the respondents do not use CMP (which is an AI-supported tool) to select the best creative assets. On the other hand, there is 41.7% of the sample who agrees with the proposition. In the fifth question, the highest percentage of the sample (43.3%) do not use AI to create tags for creative elements. 33% of the respondents are neutral towards this proposition. However, 23.3% of the sample agree that they use AI in creating tags for creative elements.

In the sixth question, another bipolar direction in the results. There is 41.6% agreement on using PAC, which is an AI tool, to fine-tune the ad content quality on the fly. On the other hand, there is almost the same percentage (41.7%) disagreement on the proposition. In the seventh question, half of the sample is more inclined to NOT using AI to design online ads. Yet, 23.3% of the sample are neutral to this notion.

In the eighth question, more than half of the sample (56.7%) disagrees that they use AI tools in the copywriting of the ad. However, 21.7% are neutral and the same percentage goes to the respondents who use AI to create Ad copy.

As for the last question to test the construct "utilization of AI in Ad creation", it explores an overall perception of digital advertisers on using AI to help them quantify the effectiveness of creative ad elements. Results show that 45% do NOT use at all AI in quantifying the effectiveness of ad elements. On the other hand, there is 41% of the sample who use AI as a helpful tool to quantify the effectiveness of creative ad elements.

4.4.3 Results of RQ3: What is the utilization of AI in online media planning and buying?

(N=60)

Table 5: Descriptive Results of Utilization of AI in Media Planning and Buying Stage (RQ3)

Reliability	0.774						
Question	Strongly disagree % (1)	Disagree % (2)	Neutral % (3)	Agree % (4)	Strongly Agree % (5)	Average	Cronbach's Alpha if item deleted
1- We use Programmatic Media buying to boost efficiency between advertisers and publishers	13.30	3.30	18.30	28.30	36.70	3.72	0.75
2- We use AI to forecast the Click-Through-Rate (CTR) of an ad impression.	15	8.30%	18.30	31.70	26.70	3.47	0.65
3- We apply Machine Learning and Deep Learning to understand digital consumer media consumption.	26.70	5%	18.30	21.70	28.30	3.20	0.69
4- We use Facebook Ads Manager and/or Google Ads to execute media planning.	-	1.7	6.70	16.70	75	4.65	0.83
5- Our agency utilizes AI in automated dynamic media planning and buying phase.	18.30	18.30	28.30	13.30	21.70	3.017	0.67

In the media planning and buying stage, most of the results are more inclined towards agreement on AI usage. In the first question, more than half of the sample (65%) use programmatic media buying to boost efficiency between advertisers and publishers. 18.3% of the sample is neutral and only 16.6% disagree. In the second question, more than half of the sample (58%) agree that they use AI to forecast CTR of an ad impression. On the other hand, 23% of the sample disagree and only 18% of the sample is neutral. In the third question, exactly half of the sample agrees that they apply ML and DL to understand online consumer media consumption. However, 31.7%

of the sample who disagree with the statement and 18.3% are neutral. In the fourth question, almost all of the sample (91%) agree that they use AI tech in Facebook Ads Manager and/or Google Ads to execute media planning. This is an impressive result.

Although there is an obvious direction towards agreement on AI utilization in media planning and buying, there is an intriguing result in the fifth question. 36% of the sample do NOT use AI in the automated dynamic media planning and buying stage. However, 35% of the sample use AI in this online advertising stage. Bearing in mind that 28% of the sample are neutral in their usage of AI in the automated dynamic media planning and buying process.

4.4.4 Results for RQ4: What are the utilization of AI in ad monitoring and evaluation? (N=60)

Table 6: Descriptive Results of Utilization of AI in Ad Evaluation Stage (RQ4)

Reliability =	0.945						
Question	Strongly disagree % (1)	Disagree % (2)	Neutral % (3)	Agree % (4)	Strongly Agree % (5)	Average	Cronbach's Alpha if item deleted
1- We use Machine Learning (ML) and Deep learning (DL) to obtain real-time online consumer feedback on various digital ads formats (text, banner and video).	23.30	11.70	26.70	20	18.30	2.98	.93
2- We use ML and DL to assess consumer feedback in media planning and buying.	23.30	10	20	26.70	20	3.10	.93
3- We use ML and DL to help us assess consumer feedback to fine-tune ad content.	25	11.7	28.30	15	20	2.93	0.93
4- We apply ML and DL in pretesting an ad.	26.70	16.7	25	16.70	15	2.77	0.93
5- We apply ML and DL in measuring the independent effect of creative elements on the target audience.	25	16.70	25	20	13.30	2.80	0.94
6- We use AI to monitor campaign performance.	15	10	16.70	28.30	30	3.48	0.94
7- Testing ads with AI technology allows us to assess online consumers real-time responses.	16.70	18.30	11.70	23.30	30	3.32	0.95

This RQ has the highest reliability relative to other RQs. It is 95%.

In the first question, 26.7% of the sample are neutral in using ML and DL to obtain real-time online consumer feedback on various ad formats. However, 38.3% of the sample use ML and DL for the former purpose. On the other hand, 35% of the sample disagreed with the proposition. Hence, there is diversification in ML and DL usage to obtain real-time online consumer feedback on various digital ad formats. In the second question, the largest percentage here goes for the respondents (46.7%) who agree with using ML and DL to assess consumer feedback in media planning and buying. However, 33.3% (second largest percentage here) do NOT use ML and DL for the mentioned purpose. Only 20% of the sample are neutral. In the third question, 36.7% of the sample do Not deploy ML and DL to help assess consumer feedback to fine-tune ad content. On the other hand, there is still 35% of the sample, which is a very close percentage to the disagreement one. In the fourth question, the largest percentage in the sample (43.4%) are respondents who NOT apply ML and DL in pretesting an ad. However, 31.7% of the sample use ML and DL in the pretesting phase. In the fifth question, 41.7% of the sample do Not use ML and DL in measuring the independent effect of creative elements on the target audience. Yet, there is still 31.7% of the sample doing so. In the sixth question, more than half of the sample (58%) use AI to monitor campaign performance, and only a quarter of the sample doesnot do so. Thus, there is an apparent acceptance ofAI utilization in monitoring campaign performance. The seventh question aims to get an overall insight on AI utilization in assessing online consumer feedback, namely Ad evaluation phase. Results show that more than half of the sample use AI tech to evaluate the ads and assess online consumers' real-time responses. However, there is still 35% of the sample who do NOT use AI in the online ad monitoring and evaluation stage.

4.4.5 Results of RQ5: Is using AI in online advertising effective? (N=60)

Table 7: Descriptive Results of Perceived Effectiveness after using AI in Online Advertising (RQ5)

Reliability	0.938						
Question	Strongly disagree % (1)	Disagree % (2)	Neutral % (3)	Agree % (4)	Strongly Agree % (5)	Average	Cronbach's alpha if item deleted
1- We become more cost-effective after applying AI tools.	6.70	8.30	31.70	28.3	25	3.57	.91
2- We become more time-efficient after applying AI tools.	6.70	5	33.30	23.3	31.70	3.68	.93
3- We become more responsive to changing consumer preferences near real-time.	3.30	3.30	30	40	23.30	3.77	.93
4- We become able to accurately measure the ROI in our online campaigns.	5	6.70	31.70	33.30	23.30	3.63	.94
5- We become more productive by using AI tools	6.70	6.70	33.30	25	28.30	3.62	.92
6- We produce better quality online campaigns using AI tools	6.70	6.70	36.70	28.3	21.70	3.52	.93
7- We can better serve our clients after applying AI tools.	5	5	28.30	35	26.70	3.73	.93
8- We become more able to meet campaign objectives.	3.30	1.70	28.30	36.7	30	3.88	.93

In the first question, the majority of the sample (53%) agrees that using AI tools led to being more cost-effective in online advertising. However, the largest percentage of the sample (31.7%) are indecisive and are having neutral positions. In the second question that asks about the time

efficiency angle, more than half of the sample (55%) perceive that by using AI, they become more time-efficient. However, 33.3% of the sample does not have a solid stance on the effect of AI on achieving time-efficiency. They are neutral. In the third question, more than half of the sample (63.3%) agree that using AI made them more responsive to the changing consumer preferences near real-time. Yet, the results show also that 30% of the sample remainundecided. In the fourth question, more than half of the sample (56.6%) agree that they become more able to accurately measure the ROI in their online campaigns. Again, almost the same percentage of the indecisive respondents who constitute 31.7% of the sample.

As the previous question, the results of the fifth question show that more than half of the sample (53.3%) agree that by using AI in online advertising, they become more productive. In the sixth question, half of the sample exactly perceive that they produce better quality online campaigns using AI tools. In the seventh question, the majority of the sample (67%) perceives that they can better serve their clients after using AI tools. However, 28.3% of the sample has a neutral stance here. In the last question, 66.7% of the sample believe that they become more able to meet campaign objectives by applying AI tools. This shows the overall perceived effectiveness achieved by utilizing AI tech in the online advertising process.

4.5 Regression Analysis

The study deployed a set of simple linear regressions to investigate the relationships between the independent variables and dependent variables. In other words, this research designed regression analysis for two purposes. The first aim is to explore the connection between the utilization of AI in each stage in online advertising with AI usage in the next stage. For example, the research attempts to know whether the utilization of AI in the online consumer discovery stage (RQ1) leads to the utilization of AI in the Ad creation stage(RQ2), or these are two separate stages in online advertising. The same goes for RQ2 → RQ3, RQ3→ RQ4.

The second aim for deploying regression analysis is to test the connection between the utilization of AI in each of the 4 stages in online advertising (RQ1, RQ2, RQ3, RQ4) and the overall effectiveness of online advertising (RQ5).

4.5.1 Relationship between RQ1 and RQ2

In the first equation, the regression model tested the relationship between the utilization of AI in consumer insights (independent variable) and the utilization of AI in Ad creation (dependent variable). R square for this relationship is 0.501 which means that utilization of AI in online consumer insights can explain more than 50% of   the variance in the utilization of AI in creating online ads.

ANOVA test

Table 8: ANOVA of Relationship between RQ1 and RQ2

Model 1	Sum of Squares	df	Mean Square	F	Sig.
Regression	36.731	1	36.731	58.302	.000[b]
Residual	36.541	58	0.63		
Total	73.271	59			

Coefficients

Table 9: Coefficient of Relationship between RQ1 and RQ2

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.378	0.326		1.158	0.252
	q1	0.729	0.096	0.708	7.636	0.000

A simple linear regression was deployed to predict utilization of AI in Ad creation (DV) based on the utilization of AI in consumer insights (IV), b= 0.71, t= 7.64, p< .001

A significant regression equation was found (F (1,58)= 58.30, p< .001 with an R square of 0.50

The significance means that the differences observed in the survey responses are statistically significant. The differences in responses are real differences and not random changes caused by sampling error

4.5.2 Relationship between RQ2 and RQ3

Second, the study tests also the relationship between utilization of AI in creating the ad (IV) and AI usage in online media planning and buying phase (Dependent variable). The R square of this relationship is 0.548 which means that utilization of AI in creating the ad can predict with more than 54% of the variance in AI utilization in media planning and buying.

ANOVA test

Table 10: ANOVA- Relationship between RQ2 and RQ3

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	29.213	1	29.213	70.304	.000[b]
Residual	24.101	58	0.416		
Total	53.314	59			

Coefficients

Table 11: Coefficients- Relationship between RQ2 and RQ3

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.878	0.223		8.435	0.000
	q2	0.631	0.075	0.74	8.385	0.000

A simple linear regression was calculated also here to predict utilization of AI in media planning and buying (DV) based on the utilization of AI in Ad creation (IV), b= 0.74, t= 8.39, p< 0.001

A significant regression equation was found (F $(1,58)$= 70.304, P< .001 with an R square of 0.548

Sig (.000) here means that the probability is very low that variation explained by the model was due to chance.

4.5.3 Relationship between RQ3 and RQ4

Regression model tests here the relationship between the utilization of AI in online media planning and buying (independent variable) and the utilization of AI in monitoring and evaluating the campaign/ad (dependent variable). The R square of this relationship is 0.704 which means that AI usage in media planning and buying can explain more than 70% of variance in AI utilization in the campaign evaluation phase. This is the highest R square among others.

ANOVA test

Table 12: ANOVA- Relationship between RQ3 and RQ4

Model 1	Sum of Squares	df	Mean Square	F	Sig.
Regression	63.837	1	63.837	138.05	.000[b]
Residual	26.82	58	0.462		
Total	90.657	59			

Coefficients
Table 13: Coefficients- Relationship between RQ3 and RQ4

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.895-	0.347		-2.577-	0.013
	q3	1.094	0.093	0.839	11.749	0.000

A simple linear regression was calculated here to predict the utilization of AI in monitoring and ad evaluation (DV) based on the utilization of AI in media planning and buying (IV), b= 0.839, t= 11.75, p< .001. A significant regression equation was found (F (1,58) = 138.05, P < .001 with an R square of 0.704.   Sig (.000) here means that the differences observed in the survey responses are statistically significant. The differences in responses are real differences and not random changes caused by sampling error.

4.5.4 Relationship between RQ1 and RQ5

The study also tests the relationship between Utilization of AI in consumer insights (independent variable) and the overall effectiveness of online advertising (dependent variable). The R Square of this relationship is .462 which means that using AI in consumer insights discovery can predict more than 46% of the variance of overall effectiveness of online advertising process.

ANOVA test

Table 14: ANOVA- Relationship between RQ1 and RQ5

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	22.47	1	22.47	49.757	.000[b]
Residual	26.193	58	0.452		
Total	48.663	59			

Coefficients

Table 15: Coefficients- Relationship between RQ1 and RQ5

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.825	0.276		6.609	0.000
	q1	0.57	0.081	0.68	7.054	0.000

A simple linear regression was calculated here to predict the overall effectiveness of online advertising (DV) based on the utilization of AI in online consumer insights (IV), b= 0.68, t= 7.1, p<.001. A significant regression equation was found (F (1,58)= 49.757, P value < .001 with an R square of 0.46. Sig (.000) here means that the differences observed in the survey responses are statistically significant. The differences in responses are real differences and not random changes caused by sampling error.

4.5.5 Relationship between RQ2 and RQ5

The effectiveness of online advertising is also the dependent variable here where the research tested the impact of AI utilization in creating the ad (independent variable) on it. R square equals 0.495 which means that using AI in creating the ad can predict more than 49% of the overall effectiveness of online advertising.

ANOVA test

Table 16: ANOVA- Relationship between RQ2 and RQ5

Model 1	Sum of Squares	df	Mean Square	F	Sig.
Regression	24.1	1	24.1	56.91	.000[b]
Residual	24.562	58	0.423		
Total	48.663	59			

Coefficients

Table 17:Coefficients- Relationship between RQ2 and RQ5

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.102	0.225		9.351	0.000
	q2	0.574	0.076	0.704	7.544	0.000

A simple linear regression was calculated here to predict overall effectiveness of online

advertising (DV) based on the utilization of AI in ad creation (IV), b= 0.68, t= 7.54, p<.001

A significant regression equation was found (F (1,58)= 56.91, P value < .001 with an R square of

0.50. Sig (.000) here means that the differences observed in the survey responses are statistically

significant. The differences in responses are real differences and not random changes caused by

sampling error.

4.5.6 Relationship between RQ3 and RQ5

The study also attempts to test the relationship between AI utilization in media planning and buying (independent variable) and the effectiveness of online advertising (dependent variable). The R square of this relationship is 0.486 which means that utilization of AI in online media planning and buying can predict more than 48% of the variance in the overall effectiveness of online advertising.

ANOVA test

Table 18: ANOVA- Relationship between RQ3 and RQ5

Model 1	Sum of Squares	df	Mean Square	F	Sig.
Regression	23.665	1	23.665	54.908	.000[b]
Residual	24.998	58	0.431		
Total	48.663	59			

Coefficients

Table 19: Coefficients: Relationship between RQ3 and RQ5

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.27	0.335		3.785	0.000
	q3	0.666	0.09	0.697	7.41	0.000

A simple linear regression was calculated here to predict overall effectiveness of online advertising (DV) based on the utilization of AI in media planning and buying (IV), b= 0.697,t=7.41, p<.001. A significant regression equation was found (F (1,58)= 54.91, P-value < .001 with an R square of 0.49. Sig (.000) here means that the differences observed in the survey responses are statistically significant. The differences in responses are real differences and not random changes caused by sampling error.

4.5.7 Relationship between RQ4 and RQ5

The study tests here the relationship between AI utilization in ad evaluation (independent variable) and its impact on the overall effectiveness of online advertising (dependent variable). The R square is 0.565 which means that using AI in evaluating and monitoring ad campaigns can predict 56% of the overall effectiveness of online advertising.

ANOVA test

Table 20: ANOVA: Relationship between RQ4 and RQ5

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	27.494	1	27.494	75.33	.000[b]
Residual	21.169	58	0.365		
Total	48.663	59			

Coefficients

Table 21: Coefficients: Relationship between RQ4 and RQ5

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.993	0.209		9.538	0.000
	q4	0.551	0.063	0.752	8.679	0.000

A simple linear regression was calculated here to predict the overall effectiveness of online advertising (DV) based on the utilization of AI in monitoring and evaluating online ads(IV), b= 0.75, t= 8.68, p<.001.A significant regression equation was found (F (1,58)= 75.33, P-value < .001 with an R square of 0.57. Sig (.000) here means that the probability is very low that variation explained by the model was due to chance. Thus, changes in the dependent variable resulted in significant changes in the independent variable.
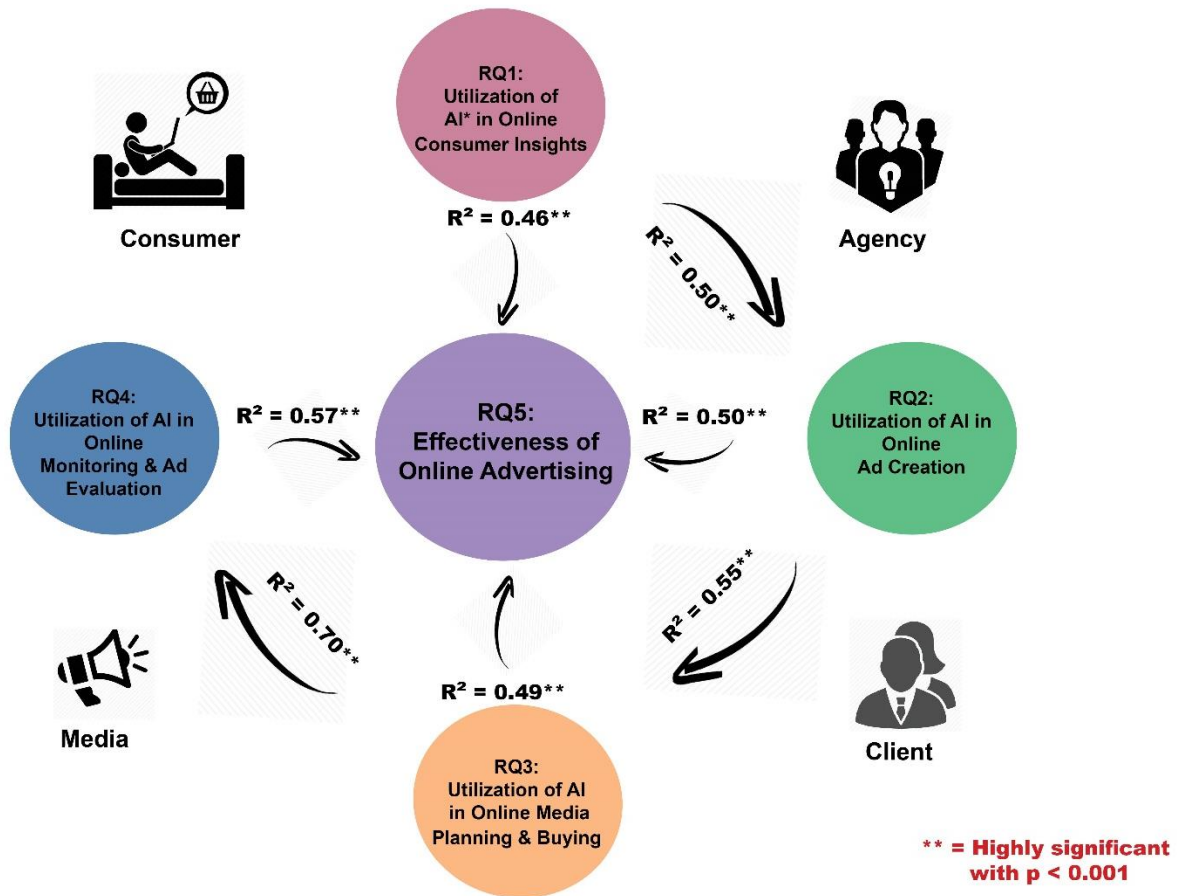
Figure 11: Results- Relationships between each Stage and Perceived Effectiveness on the model

Chapter 5: Discussion and Conclusion

5.1 Discussion of the Findings

In this chapter, we'll present the findings, elaborate their roots in the literature, and draw conclusions followed by the limitations and recommendations for future research. Moreover, three in-depth interviews were conducted after the data collection with 3 experts in digital advertising to analyze the findings and provide explanations from their global practical experience in online advertising.

This study introduces the *Process Model of the Utilization of AI in Online Advertising and its effectiveness.* Not only does the process model thoroughly test the utilization of AI in 4 key stages of online advertising and the connection between each stage to the next one, but it also measures the impact of each step on the digital advertiser's perception on the overall effectiveness of online advertising.The four key stages of online advertising were mainly derived from Qin and Jiang's Four-step Artificial Intelligence (AI) Advertising process model that is mentioned in the literature review. These four stages led to the first four constructs of this study. They are tackling the utilization of AI in each stage of the online advertising process, respectively. The process includes the following stages: Consumer Insights → Ad creation → Media Planning and buying → Ad monitoring and Evaluation. The fifth construct tackles the impact of AI utilization and its perceived effectiveness of online advertising. All the constructs are all operationalized by multi-item scales using 5-point Likert scales.

The discussion section is divided into 5 subsections to thoroughly elaborate on each construct and connect the dots between the previous literature and the findings of this study.

5.1.1 Utilization of AI in Consumer Insights:

This construct was tackled through **RQ1**: What is the utilization of AI in consumer insights discovery in the online advertising process? The respondents of the online survey were asked about various facets that indicate if they are using AI when they gather online consumer insights in their digital advertising agencies/ companies. The results significantly indicate that more than half of the samples (66.7%) highly agree with the notion of collecting and analyzing real-time big data to know online consumer insights through AI. This is highly supported bywhat Qin and Jiang said. "AI technologies are used for real-time data gathering and processing. Data gathering might involve using Internet monitoring technologies to capture online data or utilizing cameras to acquire real-time consumer data" (Qin and Jiang, 2019). Moreover, the results correlated with the opinion of Qin and Jiang that AI can reveal personality tendencies, needs, and wants of online consumers by reasoning with people's comments and posts on any digital media channel such as social media networks. Literature states that AI technology helps digital advertisers to deeply explore and mine personalized information about online users, their online lifestyle, and "behavioral trajectories." Consequently, AI utilization facilitates more efficient audience segmentation and targeting through various AI models and tools. This finding resonates with the opinion of Basem Abdel Ghani- *Marketing Director for Chocolate and Biscuits in MENAP at Mondelez*. He believes thatAI helps him to understand the underlying behaviors and habits of consumers, especially when it comes to e-commerce. Abdel Ghani said that "AI brings in some

insights from the digitalization of consumers' research on their online habits and attitudes towards digital platforms."

Furthermore, results indicate that Machine learning is a key type of AI to make precise forecasting about online consumer's preferences, needs, and wants near real-time. Various AI tools are used for real-time gathering of online consumer insights. One of them is Microsoft's AI system Azure" used for consumer profiling. The system crunches billions of data in milliseconds to find out consumers' needs and wants to cater to online content on Astro's platform in real-time to adjust with those consumer interests. As consumer's "digital footprints develop, through social-media status updates, purchasing behavior, or online comments and posts, machine learning continuously updates these profiles" (Keitzmann,2018). As for using Emotion AI software to understand consumer emotional engagement in various digital ads, results were surprising. Unlike the previous literature, the majority of the sample (43.3%) is more inclined towards the disagreement direction. Yet, there is a fair percentage (37%) of respondents who agree that emotion AI software facilitates their understanding of consumer's emotional engagement in various online ads. The opinion of the latter group of respondents resonates with what Keitzamann said. "Advertisers use emotion AI to grasp online consumers' attitudes towards their brands publicly and that Kellogg that used Affectiva's emotion AI software to help devise an advertising campaign for its Crunchy Nut cereal, eliminating advertisement executions when viewers' engagement dropped on viewing the advertisement multiple times" (Keitzamann, 2018).

5.1.2 Utilization of AI in Ad Creation

This construct was tackled through **RQ2**: What is the utilization of AI in the online ad creation? Global digital advertisers who answered the online survey shared valuable opinions. Most of the results significantly showed that using AI in the ad creation stage is still at its very early age and not highly adopted as in media planning and buying stage as well as in the monitoring stage. First of all, the Digital ad creation stage comprises the processes of crafting the big idea, copywriting the ad content, art directing, selecting the visuals, and designing the overall online ad mood.

Results significantly showed that more than half of the sample don't fully integrate AI into the creative department in their agencies. Also, the majority of the sample does not use AI in ad copywriting nor its design. However, nearly half of the sample agrees that AI is mainly used to tailor ad texts and images based on consumer's demographics, psychographics, and online behavior. Discussions with experts in in-depth interviews highly agree with the results and literature that state that ad Creation no longer depends on personal experience. Advertisements are instead data-based produced.

Naming it as "the ideation phase", Bassem Abdel Ghani highly supported the previous findings. He believed that AI is still not as integrated into the ideation phase, as much as the end of the advertising cycle which is media planning and buying and monitoring. AI is more well integrated into optimizing the reaction of online consumers on their ad campaigns. For example, in the FMCG industry, he doesn't use AI during the ad creation. AI provides him with big data that supports the "creative guard rails"; what to do and not to do in the creative. It is more of using real-time input to continuously edit and fine-tuning the ad copy, and not creating it from scratch.

Thus, AI utilization mainly facilitates "fine-tuning" the ad content and making it more personalized for multiple online users. This resonates with the Hardy et al who argues that automated creativity promises that machines are capable of altering the content of the advertising based on the user seeing the ad, where he/she is, time of the day, and contextual information such as activity type that the user is involved at while watching the ad (Hardy,2018). They were able to personalize the content of online ads for suncream based on whether a woman had children or not (Double click, 2016). authors stress the notion that advertisers "shouldn't expect robo-writers to learn cultural codes, values, aesthetics, humor, nuances of natural human languages" (Hardy, 2018). What is more pivotal is the capacity to "optimize" creative content according to principles of relevance.

As for the AI tools/terms mentioned in the process model such as Programmatic Creative Platform (PCP) that consist of processes of Dynamic Creative Optimization (DCO) and Programmatic Advertising Creation (PAC), respondents are not highly aware of these exact terms in the digital advertising field. They are more conscious of the programmatic advertising core process itself that has to do with optimizing, boosting, and fine-tuning ad content quality on the go. This is basically what PCP means in the previous literature. After the advertisement, "the machine learning algorithm will use real-time performance data to fine-tune the model and optimize the advertisement for the next round." Without PCP technology, "it is prohibitively expensive and slow for advertisers to do such a process manually" (Chen et al,2019).

Fawzy El Maawy, who has 14-year-of-experience in digital marketing and mobile advertising, is aware and applies in his online campaigns the concept of Dynamic Creative Optimization

(DCO). He uses various AI algorithms and models, yet mainly Facebook AI models, to "quantify" and test the effectiveness of creative ad elements in near real-time. This is supported by the previous literature. After choosing the creative ad elements, DCO enables advertisers to test in parallel, mainly by using ML algorithms, "the real-time performance of many variations of advertisement copies in different contexts at the same time so they can judge the elements of creative content, the target audience, and the timing of exposing the ad to the intended consumer." (Chen et al, 2019)

5.1.3 Utilization of AI in Media Planning and Buying

This construct was tackled through **RQ3**: What is the utilization of AI in online media planning and buying? The sample was asked on multiple items that are meant to capture the abstract and multidimensional nature of the construct and allow for rigorous measurement of its reliability that ended up to be highly reliable with 77%. All the results are more inclined towards agreement on AI usage in this stage of the online advertising process. More than half of the sample (65%) use programmatic media buying to boost efficiency between advertisers and publishers. 58% of the sample use AI to forecast the click-through rate (CTR) of an ad impression. Moreover, they use ML and DL to understand digital consumer media consumption.

All these findings are supported by the experts' opinions and the previous literature. Programmatic advertising "replaces human negotiations with machine learning and AI-optimization[to boost]efficiency and transparency to both the practitioners in the advertising field and the publisher" (Malthouse and Li, 2017).

Dr. Ahmed Sayed, who is a Practice Manager in Emerging Technologies and Intelligence

Platforms at Amazon Web Services (AWS) in Germany, believes that All online advertising

agencies use ML models for media planning and buying stage. The ads are published through ad

brokers and ad agencies registered in the ad tech ecosystem near real-time; few milliseconds.

Also, Bassem Abdel Aziz believes that using AI in media planning and buying is essential to

understand how people are consuming online media in general. Thus, they acquire insights on

media consumptionand how some of the platforms are very different in the way consumers react

to it. Consequently, this knowledge, supported by AI technology, affects the ideation process.

In Mondelez, they started adopting media programmatic planning and buying and are taking it a

step further to apply machine learning, which is a step beyond the programmatic. One thing

Abdelaziz realized over the last 3 years of the evolution of advertising is the duration of the

messaging. "This is not only because the younger generation has a shorter attention span. It is the

fact that digital media channels that consumers interact with have changed. Accordingly, we

have realized from AI insights and the whole digitalization era, my messaging is 6 to 7 seconds."

For example, they used to create a one-size-fits-all ad. However, they are currently applying

"personalization and scale strategy as a concept based on the fact that AI indicates which media

affinities do I need to work with."

Previous literature upholds the experts' opinions as well as the results. By definition,

programmatic media planning and buying "it optimizes the effect of correcting and tracking the

way the advertisement is executed by exposing the right message to the right people at the right

time in the most cost-effective manner through data-based real-time bidding (RTB)" (Lee et al,

2019). This uniqueness is mainly due to "the fact that programmatic buying is aimed at buying 'audience' rather than 'media'" (Lee et al, 2019). It is built on two advanced tools: "Data Management Platform (DMP)" and "Demand Side Platform (DSP)" and AI supportsboth to enable the "programmatic buying" process.

Advertisers use the large pool of unique user big data that is provided by DMP "to evaluate each potential impression opportunity and strategically bid for it using machine learning algorithms via DSP" (Chen et al, 2019). DMP allows individualized segmentation and "advertisers can see each user as a combination of tags and precisely pin down each target by selecting a desirable mix of tags" (Chen et al, 2019).

Moreover, machine learning such as "collaborative filtering" will have a more effective performance by the escalating number of observations. "Because the clickstream data can help identify the preference of a user, a real-time recommender system can push a potential solution to the user while he or she is navigating through different pages" (Chen and Yao 2017; Kumar et al. 2019). Ahmed Sayed agrees that AI is useful in the "Recommendation Engine" (Search engine) based on the data that the media platform has. "DSP takes advantage of machine learning algorithms, such as neural networks, to uncover hidden layers of tags by computing the weighted combinations of tags" (Rauber et al. 2016). In a comparative sense, it goes beyond "traditional intuitive by revealing consumer attributes and needs interpretation" (Rauber et al. 2016). A supply-side platform or Sell-Side Platform (SSP) is key in this discussion and it is mentioned in the process model of this study in the media planning and buying stage. SSP is a type ofadvertising technology (adtech) that aids publishers and online media owners optimize their ad inventory in an efficient and automated way mainly using ML models to achieve the real-time aspect.

Furthermore, results significantly show that 75% of the sample use particularly Facebook Ads

Manager and/ or Google Ads to execute media planning. Experts from in-depth interviews

clarified that finding. Ahmed Sayed explained that Facebook algorithms are strong and effective

because of the quality data and not because of theiralgorithms. Facebook monitors near real-time

online consumer behavior, thus the predictions of its robust AI models are super accurate and

informative in advertising decisions per se. Thus, it is effective and popular. Supporting this

explanation, Bassem Abdelaziz also believes that Facebook and Google AI models are built on

huge online big data of consumer's digital touchpoints and AI algorithms work better with an

abundance of big data. Over time, both Facebook and google were very fast in adopting new

technology and start-ups who are data-driven. Google started that technological track, followed

by Facebook. As a client, Abdelaziz knows that once he puts his ad on any of their platforms, he

will gain the maximum ROI and benefit. Besides, Hazem Bahaa, the Head of Global Marketing

Communication Team in SWVL, states that they mainly depend on Facebook AI models because

it is more affordable than Google. Thus, the cost of AI technology tools can be a game-changer.

5.1.4 Utilization of AI in Online Ad Monitoring and Evaluation

This construct is tackled through **RQ4:** What is the utilization of AI in Ad monitoring and

Evaluation? There are various ways to test and evaluate an ad. However, the Evaluation step in

digital advertising has become more prompt and dynamic. Adopting AI in the ad evaluation

phase makes it more data-driven by obtaining real-time online consumer feedback on various ads

and the online media used. Having the highest reliability (94%) among other online advertising

stages, results indicate that more than half of the sample significantly agree that they use AI to

monitor campaign performance. Additionally, they believe that testing ads with AI technology allows them to assess online consumers' real-time responses.

These findings resonate with what the experts said in in-depth interviews. They all agree that the evaluation stage is ultimately crucial particularly in digital advertising online. However, they name the evaluation stage with various terms. For example, Hazem Bahaa names it as the "Trial and Error" stage which is core in his daily advertising business in SWVL worldwide. To know more about their online consumer's feedback and sentiment towards the brand/ ad, they seek social media listening through a tool called Meltwater. "It is the first to produce online media monitoring and applies AI-driven media intelligence. It is super effective in tracking the impact of our campaigns and sentiment analysis in real-time and in understanding our competitors' online footprint. With over 500 million new documents added every day, Meltwater utilizes AI to find out content from all corners of the internet in near real-time." Bahaa adds that in the growth ads function they mainly use *trial and error* to assess which ad content is more effective in terms of getting more conversions and acquisitions; the main KPI here. Briefly, the growth ads team is like a funnel that pushes the online consumer to do the call-to-action of the ad. Thus, the content is skewed towards pure call-to-actions. They track and evaluate consumer's online attitudes towards the brand and accordingly they keep remarketing and retargeting the online campaign on the fly, using ML and AI tools. For example, SWVL in the new market entry scenario, the growth ads team boosts awareness posts through mass segmentation. Then, according to various AI tools like Facebook, they start retargeting the mass according to the received impressions of their ads.

As for Bassem Abdelaziz, he names the evaluation stage as the "real-time editing process" which he perceives as highly affected by AI. He said that "Through data analysis of our ads that we got from our partnership with Facebook and google after buying the spot, we realized that some six-second Ads got very low CTR and that we lost our consumers." Consequently, he has started to re-edit in real-time. He added that "the edit is based on knowing through AI what are the assets in my ad copy that are allowing them to stay and watch the ad and Picasso Lab is a global agency that aids us in seizing the creative assets that we have by choosing the best platform to publish the ad on." For example, Abdelaziz realized through AI data collection that we need to turn off the music of any creative ad on Facebook as consumers do not watch on Facebook videos with high volume. This resonates with the previous literature which state that "the impact of digital ads is measured with AI technologies such as Machine Learning and Deep Learning to collect "real-time feedback data" from big data of different digital channels in various formats such as numeric, photos, voice, texts, or videos"(Thi, Le, and Dinh 2015). "When the expected objectives and goals are not achieved, both the targets and the content must be taken into consideration to reveal the causes so that smart responses can be made accordingly" (Qin and Jiang, 2019). Although the majority of the sample test ads with AI tech to assess online consumers' real-time responses, on average 40% of the sample disagree with using, particularly, Machine Learning and Deep Learning to pretest an ad or to measure the independent effect of creative elements on the target audience. The only available explanation for that coincidence is that digital advertisers who answered the survey are still not familiar with ML and DL terms and its algorithms. They do agree on using AI tech that is embedded in familiar toolkits such as Facebook Ad Manager or Google. However, they are unaware ofthe know-how of AI technology and its role in the evaluation phase.

5.1.5 The Impact of Using AI on the Perceived Effectiveness of Online Advertising Process

Besides testing the utilization of AI in the four stages of online advertising, the process model attempted to explore the impact as well of using AI in each stage on the overall perceived effectiveness of online advertising. The study tackled this angle through **RQ5:** What is the impact of using AI in the previous 4 stages on the overall perceived effectiveness of online advertising? The reliability of this section is highly significant reaching 94%. More than half of the sample highly agree that using AI technology has positively affected the overall effectiveness of their advertising. Asking them multi-item scales using 5-point Likert scales, the majority of the respondents agree that after using AI technology, they become more cost-effective, more time-efficient, more responsive to the changing consumer preferences near real-time. Besides, more than half of the sample highly agree that by applying AI tools they more accurately measure the ROI, and are more productive in achieving better quality online campaigns. Overall, the results significantly show that using AI has allowed digital advertisers who answered the survey to better serve their clients and more able to meet campaign objectives.

In reality, the previous literature on AI has not declared yet a clear scale to measure the impact of AI on the effectiveness of online advertising. However, this study managed to contribute with a clear scale for that purpose. The scale is provided in chapter 2 that explains the process model and its five constructs. Nevertheless, the researcher concluded some points of this scale from Qin and Jiang's work. They stated that AI technology has made the online advertising process more

synchronized, and more time-efficient. "Once ad content is created, media planning and buying

takes only a matter of seconds, and so does ad impact evaluation and improvement.

Therefore, this new process no longer requires yearly or quarterly planning" and occurs in near

real-time. (Qin and Jiang, 2019) Moreover, the authors stated that by applying AI technologies,

"the new advertising process is more tool-based, synchronized, and highly efficient, and it has

significantly improved the advertising operation in its cost, quality, service, and speed."(Qin and

Jiang, 2019). This part ofthe literature is not only supported by the results of this study as

mentioned above, but it is also approved by the experts in the in-depth interviews. The Global

Marcom head at SWVL said that their main objective in their online ad campaigns is to be highly

personalized in the ad message. From his point of view, the more the campaign is tailored to the

consumer, the more effective it is. This effectiveness is shown in the increasing number of

conversions to SWVL applications. He said that "AI data analysis aids a lot in this area. As a

result, SWVL has started using Machine Learning which is truly beneficial. It gives clarity and

solid insights."

Simple linear regression analysis of this study showed highly significant relationships between

each stage in online advertising and its overall perceived effectiveness. Starting with the

consumer insights stage, results indicated that using AI in it can predict more than 46% of the

variance of the overall effectiveness of online advertising processes. Second, using AI in creating

the ad can predict more than 49% of the overall effectiveness of online advertising. Third, the

utilization of AI in online media planning and buying stages can predict more than 48% of the

variance in the overall effectiveness of online advertising. Finally, using AI in evaluating and

monitoring ad campaigns can predict 56% of the overall effectiveness of online advertising. The

strength of these relationships is another contribution of the process model of this study. There is

a lack of evidence in the previous literature ofthe calculated strength of the former relationships.

5.1.6 Relationship between the 4 Main Stages in the Process Model of AI Utilization in Online Advertising

This study's process model tested the relationship of the utilization of AI in each stage to the

usage of AI in the next stage. First, the findings indicate that the utilization of AI in online

consumer insights can explain more than 50% of the variance in the utilization of AI in creating

online ads. This relationship is supported by the previous literature. "With the help of the results

derived from consumer insight discovery, consumers' preferences for creative advertising are

inferred. Based on real-time consumer interactions, consumers' preferences for creative

advertising are studied to predict the probability for consumers' acceptance of a certain

advertising idea in the foreseeable future." (Qin and Jiang, 2019). Second, regression analysis

significantly shows that the utilization of AI in creating the ad can predict with more than 54% of

the variance in AI utilization in media planning and buying. Third, simple Regression analysis

significantly shows that AI usage in media planning and buying can explain more than 70% of

the variance in AI utilization in the campaign evaluation phase. This is the strongest relationship,

among others. The literature says that "according to the analysis results of ad impact,

adjustments are made to targets of media planning and buying as well as the advertising

content." (Qin and Jiang,2019). This is thoroughly explained in the previous sections in the

discussion. The process model of this study tackles online advertising as a cycle where one step

leads to another in an iterative approach. The cyclicalnature of the process is inspired from Qin

and Jiang Model (See Figure 2) that literature that AI-enabled advertising is "a new set of

process steps—consumer

insight discovery, ad creation, media planning, and buying, and ad impact evaluation— that has

emerged (Jiang and Ma 2019)." However, there is no measured back and forth relationship

between a stage and another. Literature and experts' interviews explain that back-and-forth

relations. The most prominent finding in the post-survey in-depth interviews is the relationship

between using AI in the ad evaluation stage (RQ4) and ad creating stage (RQ2) as well as media

planning and buying stage (RQ3). The experts and literature review name the relationship

between RQ2 and RQ4 and vice versa as Dynamic Creative Optimization (DCO). The

relationship is implicitly covered in the discussion of the model however not directly measured.

5.2 Conclusion

Traditionally, the advertising process could take tremendous work and a great deal of time to

launch a new campaign before the internet age. Consumer research was implemented manually

and faced various restrictions; hence there was a lack of profound consumer insights. Then, the

creative team would manually work on the ad creation and decide on the art direction,

copywriting, and entire design without a wide range of technological tools that could facilitate

the ad creation process. Then, the agency would deploy the campaign according to the budget

that the client has allocated. Media planning and buying werenot that challenging as our

contemporary time due to the limited media channels by then, Radio, TV, and Print media. In the

evaluation phase, there was a bit of manual analysis that would occur to select the highest

performance ads, the perfect target audience, and opportunities for the next moves of the

advertising campaign. It could be substantially challenging to draw a correlation between the

promotion tools used in the integrated marketing communication plan and various metrics of

campaign success. Moreover, the client and/or agency would not be sure that the campaign was optimized and the objectives. Hence, traditional advertising can be characterized as a linear process, time-consuming, costly, and limited in insights collection

As the digital era stepped in, advertisers and clients started to have access to a great deal of consumer online big data and leverage it to the benefit of the campaign. Thus, the advertising process started to be less time-consuming with better creativity and more knowledgeable and impactful due to the nature of digital technology. As time moved on, the concept of big data emerged leading to exponential personalized consumer online data readily available. However, advertisers and clients realistically couldn't process all of the timely big data in an integrated way. At this point, Artificial Intelligence has grabbed a foothold in online advertising. Brands and agencies have started to utilize AI and ML to deeply mine and explore the online consumer's lifestyle and his/her behavioral trajectories and update it near real-time. Being dynamic and Optimizing are two key properties for AI advertising. The online advertising process has become more data-driven where digital advertisers are capable of testing near real-time the performance of their ads in a more customized manner for multiple online users. The study is one of the early academic works that attempts not only to measure empirically the using AI in the main four online advertising stages; namely consumer insights, advertisement creation, media planning and buying, and finally the ad evaluation stage. The findings of the study significantly showed that there is near consensus on using AI in the four steps of online advertising and that it is slowly but surely coming. Moreover, findings indicated that using AI in every stage of online advertising highly promotes the perceived effectiveness of the campaign.

5.3 Managerial Applications

This section addresses the implications of this research for managers. This study is primarily directed to managers working in digital advertising from two backgrounds: agency-side and client-side.

5.3.1 Managers from the Client Side:

Top management from client-side is addressed and included in the survey since they are typically involved in all phases of developing and producing online advertising campaigns by the virtue of supervision and quality insurance. Managers from the client-side can be working as advertising managers and/or specialists, corporate communication managers, online advertising specialists, marketing communication managers.

When it comes to choosing an online advertising agency to work with, managers should pick out digital agencies that are supported byAI technologies regardless of the cost. The findings of this study significantly showed that global advertising agencies and clients are moving slowly but surely towards the utilization of AI in all advertising phases, yet with different magnitudes in each stage separately. Additionally, managers should be keen on applying AI tech; whether in-house online advertising or outsourcing, as findings of this study, significantly indicated that using AI in consumer insights, Ad creation, media planning and buying or evaluation promotes the perceived effectiveness of the overall campaign. Achieving effectiveness is key for all campaigns in all industries, particularly in the real-time and dynamic online world stuffed with big data. Utilization of AI continues to contribute to a positive development in online advertising campaigns, not just from cost savings and increasing conversions, but also from facilitating high levels of personalization for multiple online users.

There are some data-driven industries suc as telecom may find it not challenging to embrace AI technology in their online advertising campaigns. However, utilizing AI in online advertising is doable and feasible in other industries by outsourcing AI-supported advertising agencies. A compelling example for that is Bassem Abdel Ghanythe *Marketing Director for Chocolate and Biscuits in MENAP at Mondelez.* He outsourced various AI-enabled digital advertising, and online media planning and buying agencies like Picasso Lab and others. He knows the power of AI and particularly Machine Learning in the real-time editing of the online ads in various online platforms.

5.3.2 Managers from the Agency side

AI will not replace humans in creative jobs. However, online advertisers should invest in learning AI technologies to have a competitive advantage. They should learn Machine Learning or get to know highlights about it and how it is efficiently fed to produce impactful insights for their online campaigns. It is not about learning the know-how of coding and formulating AI models. It is about understanding the power of ML, DL, NLP, NLG as well as other AI tools, when and why to use it in your campaign. If the agency does not have a robust data science team, they can primarily purchase available software that provides AI technology and analysis. Global head of Marketing in SWVL uses, for example, software like Braze, Amplitude, and Adjust. All of them apply various AI and ML models that facilitate their decision making in their campaigns.

Moreover, findings of this study highly advise online advertisers to partner with Facebook and/or Google and seize agreat deal of deep and game-changer insights when they do online campaigns. Google and Facebook have an impressive database. According to the *Washington Post*, "Facebook alone has 98 personal data points on its 2.2 billion users, totaling 215.6 billion data

points" (Deway, 2016). As for Google, it collects enough personal data from its users "over the course of one year to equal 569,555 sheets of paper. If printed and stacked, this would measure more than 189 ft. tall." (Ellery,2018). Both marketers and online advertisers know that consumer behavior is always evolving and changing, and AI is capable to alter with it. Digital advertisers should start hiring the right people to guide the AI technology. In other words, a blend of data scientists and software engineers would be imperative in the coming period. Managers from either client or agency side need to digest that AI is not a magic bullet and that there are certain limitations they need to know to set realistic expectations when they plan their online campaigns.

5.4 Limitations

The main limitation of this study is the sample size. The researcher started the data collection with a target sample size of 250+. Due to the Coronavirus crisis, many key respondents (such as IAA and Linkedin Groups) who were supposed to distribute our survey to members in their network, apologized as questionnaire distribution was a little bit challenging. Few yet significant participants who responded. Most of the professionals, who were approached, were either apologetic or no response due to the global coronavirus crisis. Although the sample size was 60 respondents, the findings and relationships in the process model of the study were highly significant. The results were consistent inspite of the variance in the demographics of the sample, the number of working experience years, background experience whether client-side or agency-side, and geographical segmentation.

5.5 Future Research

Based on the previous literature and new findings of this study, it is highly recommended to empirically measure the back-and-forth relationship between Utilization of AI in Ad creation

stage (RQ2) and Utilization of AI in evaluation stage (RQ4) which is named by the literature review and post-survey interviews Dynamic Creative Optimization (DCO). Moreover, the four entities in the ecosystem of the Process Model of this study named as consumer, agency, client, and media are recommended as well to be tested to know their impact in the AI-enabled advertising process.

The study attempted to test the global perspective of digital advertisers as much our time and resources allowed. There was no intentionally specific geographic segmentation. Thus, future research can dive deeper in testing the process model on more specified regions; such as Far East and China, USA, Europe, Africa, MENA region.

Moreover, the process model can be tested on various industries. Future studies can measure the impact of AI utilization on online adverising and its effectiveness in FMCGs. Others can test the same yet on banking, or telecommunication, or healthcare…etc. That would yeild interesting findings.

Further more, the process model can be developed to measure the impact of AI not only online advertising, but also it can measure the AI impact on Integrated Marketing Communications (IMC) where we blend both the traditional and digital advertsing tools.

Last but not least, process model can be developed to deeply reflect more on the AI techonologies; in terms of AI softwares and tools. The experts interviews and findings of the study already mentioned few and contributed with generic framework. However, numerious studies can empirically test the AI software perspective.

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Appendix A: Online Questionnaire of the Study

Phase 1: Advertising Research and Consumer Insights

Below you are represented with a list of statements about the AI application in the advertising research and consumer insights phase in the digital advertising process. Please indicate to what extent you apply AI technologies in this phase where
1= Strongly Disagree
2= Disagree
3= Neutral
4= Agree
5= Strongly Disagree

1- We acquire and use real-time big data to reach consumer insights
2- We apply Natural Language Processing (NLP) to analyze and reveal online consumer attitudes and preferences.
3- We use Emotion AI software to understand consumer emotional engagement to various digital ads.
4- We use Machine Learning (ML) to make precise forecasts about online consumers' purchase intention.
5- We use AI to create strong lead profiles.
6- We use AI to make efficient audience segmentation and/ or targeting.
7- Overall, we collect and analyze big data of online consumers efficiently with AI technology.

Phase Two: Ad Creation

Below you are represented with a list of statements about the AI application in the ad creation phase in the digital advertising process. Ad creation comprises all creative elements such as copyright and artwork. Please indicate to what extent you use AI technologies the ad creation phase where
1= Strongly Disagree
2= Disagree
3= Neutral
4= Agree
5= Strongly Agree

1- We apply AI technology to tailor ad texts and images based on consumer's demographics, psychographics, and/or online behavior.
2- We fully integrate AI machines into the creative department.
3- We use AI to judge elements of creative content.
4- We use Content Management Platform (CMP) to select the best creative assets online.
5- We use AI to create tags for creative elements.

6- We use Programmatic Advertising Creation (PAC) to fine-tune the ad content quality on the fly.
7- We use AI to design digital ads.
8- We use AI to create the ad copy.
9- We apply AI to help us quantify the effectiveness of creative ad elements.

Phase 3: Media Planning and Buying

Below you are represented with a list of statements about the AI application in the media planning and buying phase in the digital advertising process. Please indicate to what extent you use AI technologies this phase where:

1= Strongly Disagree
2= Disagree
3= Neutral
4= Agree
5= Strongly Agree

1- We use Programmatic Media buying to boost efficiency and transparency between advertisers and publishers.

2- We use AI to forecast the Click-Through-Rate (CTR) of an ad impression.

3- We apply Machine Learning and Deep Learning to understand digital consumer media consumption.

4- We use Facebook Ads Manager and/or Google Ads to execute media planning.

5- Our agency utilizes AI in automated dynamic media planning and buying phase.

Phase Four: Ad Evaluation

Below you are represented with a list of statements about the AI application in the evaluation phase in the digital advertising process. The evaluation here comprises the pre ad test, during the campaign, and post ad test. Please indicate to what extent you use AI technologies in the evaluation phase where
1= Strongly Disagree
2= Disagree
3= Neutral
4= Agree
5= Strongly Agree

1- We use Machine Learning and Deep learning to obtain real-time online consumer **feedback** on various digital ads formats (text, banner and video)

2- We use ML and DL to assess consumer feedback in media planning and buying.

3- We use ML and DL help us assess consumer feedback to use ad content.

4- We apply ML and DL in pretesting an ad.

5- We apply ML and DL in measuring the independent effect of creative elements on the target audience.

6- We use AI to monitor campaign performance.

7- Testing ads with AI technology allows us to assess online consumers real-time responses.

Effectiveness of AI Application on Digital Advertising Process.

Below you are represented with a list of statements about the effectiveness of AI application on the digital advertising process. Please indicate to what extent you agree or disagree with the statements where
1- Strongly Disagree
2- Disagree
3- Neutral
4- Agree
5- Strongly Agree

1- We become more cost-effective after applying AI tools.
2- We become more time-efficient after applying AI tools.
3- We become more responsive to the changing consumer preferences.
4- We become able to accurately measure the ROI in our online campaigns.
5- We become more productive.
6- We produce better quality online campaigns
7- We better serve our clients
8- We are more able to meet campaign objectives.

In-depth Interviews Guideline

1- What do you think of the online survey?
2- Do you have any comments on the process model of the study?
3- From your work experience, do you use AI in your advertising process? Ellaborate please with recent examples.
4- Results indicate that the majority of the sample use AI more often in the media planning and buying stage as well as the evaluation stage. What is your explanation for this finding?
5- Results show that the majority of the sample highly perceive the effectiveness of using AI in their online advertisement process. How can you reflect that finding on your working experience?

Appendix B: Approvals

IRB Approval

CASE #2019-2020-100

THE AMERICAN UNIVERSITY IN CAIRO
INSTITUTIONAL REVIEW BOARD

To: Nouran Tahoun

Cc: Nesrine Sorour

From: Atta Gebril, Chair of the IRB

Date: April 25, 2020

Re: IRB approval

This is to inform you that I reviewed your revised research proposal entitled "The Role of Artificial Intelligence (AI) in Online Advertising" and determined that it required consultation with the IRB under the "expedited" category. As you are aware, the members of the IRB suggested certain revisions to the original proposal, but your new version addresses these concerns successfully. The revised proposal used appropriate procedures to minimize risks to human subjects and that adequate provision was made for confidentiality and data anonymity of participants in any published record. I believe you will also make adequate provision for obtaining informed consent of the participants.

This approval letter was issued under the assumption that you have not started data collection for your research project. Any data collected before receiving this letter could not be used since this is a violation of the IRB policy.

Please note that IRB approval does not automatically ensure approval by CAPMAS, an Egyptian government agency responsible for approving some types of off-campus research. CAPMAS issues are handled at AUC by the office of the University Counsellor, Dr. Ashraf Hatem. The IRB is not in a position to offer any opinion on CAPMAS issues, and takes no responsibility for obtaining CAPMAS approval.

This approval is valid for only one year. In case you have not finished data collection within a year, you need to apply for an extension.

Thank you and good luck.

Dr. Atta Gebril
IRB chair, The American University in Cairo
2046 HUSS Building
T: 02-26151919
Email: agebril@aucegypt.edu

Institutional Review Board
The American University in Cairo
AUC Avenue, P.O. Box 74
New Cairo 11835, Egypt.
tel 20.2.2615.1000
fax 20.2.27957565
Email: aucirb@aucegypt.edu

CAPMAS Approval Letter

الجهاز المركزي للتعبئة العامة والإحصاء

القيـــد :..............
التاريـــخ : ٢٠٢٠ / ٥ / ..

الموضوع :..............
المرفقات :..............

السيد الأستاذ الدكتور/ مستشار الجامعة الأمريكية بالقاهـرة

تحيـــة طيبـــة وبعـد ،

بـالإشارة لكتاب سيادتكم ومرفقاتـه الـوارد للجهاز بتاريخ ٢٠٢٠/٥/٢١ بشـأن طلب الموافقة على قيـام الباحثـة/ نـوران عمـرو محمد علـى طاحـون – المسجلة لدرجة الماجستير بقسـم الصحافة والإعلام/ كلية الشئون الدولية والسياسـة العامـة GAPP بالجامعـة الأمريكيـة بالقاهرة - بإجراء دراسة ميدانية بعنوان: (استخدام الذكاء الصناعى فى الإعلان الرقمى وفاعليته).

وذلك وفقا للإطار المُعد لهذا الغرض.

يرجى التكـرم بالإحاطـة بأن الجهـاز المركـزي للتعبئـة العامـة والإحصـاء يوافق على قيـام الباحثـة/ نـوران عمـرو محمد علـى طاحـون - بإجـراء الدراسة الميدانية المشـار إليها بعـالية وفقا للقرار رقم (٦٩٠-١) لسنة ٢٠٢٠/ ٢٠١٩ اللازم في هذا الشأن وعلى أن يوافى الجهاز بنسخـة من النتائج النهائية كاملة فور الانتهاء من إعدادها طبقا للمادة رقم (٦) من القرار.

وتفضلوا بقبول فائق الاحترام ،،،

مجدى محمد جـاد
القائم بأعمال
مدير عام الإدارة العامة للأمن

جمهورية مصر العربية

الجهاز المركزى للتعبئة العامة والإحصاء

قرار رئيس الجهاز المركزي للتعبئة العامة والإحصاء
بالتفويض
رقم (١٦٩٠) لسنة ٢٠٢٠/٢٠١٩

فى شأن قيام الباحثة/ نوران عمرو محمد على طاحون – المسجلة لدرجة الماجستير بقسم الصحافة والإعلام/ كلية الشئون الدولية والسياسة العامة GAPP بالجامعة الأمريكية بالقاهرة - بإجراء دراسة ميدانية بعنوان: (استخدام الذكاء الصناعى فى الإعلان الرقمى وفاعليته).

رئيس الجهاز

- بعد الإطلاع على القرار الجمهوري رقم (٢٩١٥) لسنة ١٩٦٤ بشان إنشاء الجهاز المركزى للتعبئة العامة والإحصاء.
- وعلى قرار رئيس الجهاز رقم (٢٣١) لسنة ١٩٦٨ في شأن إجراء الإحصاءات والتعدادات والاستفتاءات والاستقصاءات.
- وعلى قرار رئيس الجهاز رقم (١٣١٤) لسنه ٢٠٠٧ بشان التفويض في بعض الاختصاصات.
- وعلى كتاب الجامعة الأمريكية بالقاهرة - الوارد للجهاز فى ٢٠٢٠/٥/٢١.

قــــرر

١: تقوم الباحثة/ نوران عمرو محمد على طاحون – المسجلة لدرجة الماجستير بقسم الصحافة والإعلام/ كلية الشئون الدولية والسياسة العامة GAPP بالجامعة الأمريكية بالقاهرة - بإجراء الدراسة الميدانية المشار اليها عالية.

٢: تجرى الدراسة على عينة حجمها (١٠٠) مائة مفردة من (أصحاب الشركات - المديرين – العاملين) بالوكالات الإعلانية فى مصر - وذلك عن طريق التليفون ومواقع التواصل الإجتماعى.

٣: تجمع البيانات اللازمة لهذه الدراسة بموجب الاستمارة المُعدة لذلك وعدد صفحاتها ست صفحات - والمُعتمدة كل صفحة منها بختم الجهاز المركزى للتعبئة العامة والإحصاء.

٤: يراعي موافقة مفردات العينة – وسرية البيانات الفردية طبقاً لأحكام قانون الجهاز رقم (٣٥) لسنة ١٩٦٠ والمُعدل بالقانون رقم (٢٨) لسنة ١٩٨٢ وعدم استخدام البيانات التي يتم جمعها لأغراض أخري غير أغراض هذه الدراسة.

٥: يجرى العمل الميدانى خلال شهر من تاريخ صدور هذا القرار.

٦: يوافى الجهاز المركزى للتعبئة العامة والإحصاء بنسخة من النتائج النهائية لهذه الدراسة.

٧: تلتزم الباحثة/ نوران عمرو محمد على طاحون – بإبلاغ مديرية الأمن بمحافظة القاهرة بصورة من هذا القرار وقبل البدء فى التنفيذ مرفقاً بها بيانات القائمين لهذه الدراسة الميدانية (الاسم الرقم القومي - تاريخ بدء وانتهاء تنفيذ الدراسة).

٨: ينفذ هذا القرار من تاريخ صدوره.

فى: ٢١/٥/٢٠٢٠.

٥ /١٢١

/ حماد

مجدى محمد جاد
القائم بأعمال
مدير عام الإدارة العامة للأمن

أنت مدعو للمشاركة في بحث لاستكشاف استخدام الذكاء الاصطناعي في الإعلان عبر الإنترنت وفعاليته.

يمكن نشر النتائج المجمعة المجهولة أو عرضها أو كليهما.

يجب أن يستغرق إكمال هذا الاستطلاع ١٥ دقيقة.

في جميع الحالات ، تكون المعلومات التي تقدمها لأغراض هذا البحث مجهولة وسرية

نشكرك على تخصيص بعض الوقت للمشاركة في هذا الاستبيان!

مساعدتكم هو موضع تقدير كبير.

أنت تعمل في الإعلان عبر الإنترنت من *

جانب الوكالة

جانب العميل (داخليًا)

على حد سواء

تَستند تجربتك الإعلانية عبر الإنترنت في البلد *

المرحلة ١: البحث الإعلاني ورؤى المستهلك

فيما يلي قائمة بقواعد حول تطبيق الذكاء الاصطناعي في مرحلة البحث الإعلاني ورؤى المستهلك في عملية الإعلان الرقمي. يرجى تحديد مدى تطبيق تقنيات الذكاء الاصطناعي في هذه المرحلة

١ = لا أوافق بشدة

٢ = لا أوافق

٣ = محايد

٤ = موافق

٥ = لا أوافق بشدة

١- نحصل على بيانات كبيرة في الوقت الحقيقي ونستخدمها للوصول إلى رؤى المستهلك

٢- نطبق معالجة اللغات الطبيعية لتحليل مواقف المستهلكين وتفضيلاتهم والكشف عنها.

٣- نستخدم أدوات Emotion AI soft لفهم التفاعل العاطفي للمستهلك مع الإعلانات الرقمية المختلفة.

٤- نستخدم التعلم الآلي لعمل توقعات دقيقة حول نية شراء المستهلكين عبر الإنترنت.

٥- نستخدم الذكاء الاصطناعي لإنشاء ملفات شخصية قوية.

٦- نستخدم الذكاء الاصطناعي لتجزئة الجمهور و / أو الاستهداف بكفاءة.

٧- بشكل عام ، نقوم بجمع وتحليل البيانات الضخمة للمستهلكين عبر الإنترنت بكفاءة باستخدام تقنية الذكاء الاصطناعي.

المرحلة الثانية: إنشاء الإعلان

١- نطبق تقنية الذكاء الاصطناعي لتخصيص نصوص الإعلانات والصور بناءً على التركيبة السكانية للمستهلك و / أو الخصائص النفسية و / أو السلوك عبر الإنترنت.

٢- نقوم بدمج أجهزة الذكاء الاصطناعي بشكل كامل في القسم الإبداعي.

٣- نستخدم الذكاء الاصطناعي للحكم على عناصر المحتوى الإبداعي.

٤- نستخدم منصة إدارة المحتوى (CMP) لاختيار أفضل الأصول الإبداعية عبر الإنترنت.

٥- نستخدم الذكاء الاصطناعي لإنشاء علامات للعناصر الإبداعية.

٦- نستخدم إنشاء الإعلانات الآلية (PAC) لضبط جودة محتوى الإعلان بسرعة.

٧- نستخدم الذكاء الاصطناعي لتصميم الإعلانات الرقمية.

٨- نستخدم الذكاء الاصطناعي لإنشاء نسخة الإعلان.

٩- نطبق الذكاء الاصطناعي لمساعدتنا في تحديد فعالية عناصر الإعلان الإبداعية.
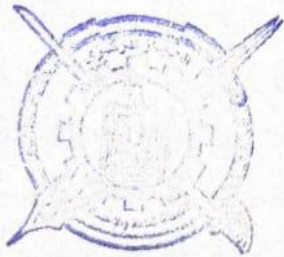
المرحلة ٣: التخطيط الإعلامي والشراء

١- نستخدم شراء الإعلانات الآلية لزيادة الكفاءة والشفافية بين المعلنين والناشرين.

٢- نستخدم الذكاء الاصطناعي للتنبؤ بنسبة النقر إلى الظهور (CTR) لمرة ظهور الإعلان.

٣- نطبق التعلم الآلي والتعلم العميق لفهم استهلاك الوسائط الرقمية الاستهلاكية.

٤- نستخدم Facebook Ads Manager و / أو إعلانات Google لتنفيذ التخطيط الإعلامي.

٥- تستخدم وكالتنا الذكاء الاصطناعي في التخطيط الإعلامي الديناميكي الآلي ومرحلة الشراء.
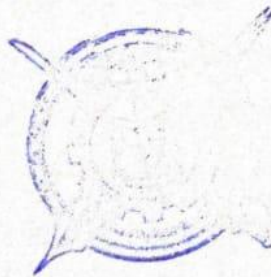
المرحلة الرابعة: تقييم الإعلان

١- نستخدم التعلم الآلي (Machine Learning) والتعلم العميق (Deep learning) للحصول على تعليقات المستهلكين عبر الإنترنت في الوقت الفعلي على مختلف تنسيقات الإعلانات الرقمية (نص وبانر وفيديو)

٢- نستخدم التعلم الآلي (Machine Learning) والتعلم العميق (Deep learning) لتقييم ملاحظات المستهلك في التخطيط الإعلامي والشراء.

٣- نستخدم التعلم الآلي (Machine Learning) والتعلم العميق(Deep learning) لمساعدتنا في تقييم ملاحظات المستهلكين لاستخدام محتوى الإعلان.

٤- نطبق التعلم الآلي (Machine Learning) والتعلم العميق(Deep learning) في الاختبار المسبق للإعلان.

٥- نطبق التعلم الآلي (Machine Learning) والتعلم العميق(Deep learning) في قياس التأثير المستقل للعناصر الإبداعية على الجمهور المستهدف.

٦- نستخدم الذكاء الاصطناعي لمراقبة أداء الحملة.

٧- يسمح لنا اختبار الإعلانات باستخدام تقنية الذكاء الاصطناعي بتقييم استجابات المستهلكين عبر الإنترنت في الوقت الفعلي.

فعالية تطبيق الذكاء الصناعي في الإعلانات عبر الانترنت:

1- نصبح أكثر فعالية من حيث التكلفة بعد تطبيق أدوات الذكاء الاصطناعي.

2- نصبح أكثر كفاءة في استخدام الوقت بعد تطبيق أدوات الذكاء الاصطناعي.

3- نصبح أكثر استجابة لتفضيلات المستهلك المتغيرة.

4- نصبح قادرين على إنشاء حملات قابلة للقياس.

5- نصبح أكثر قدرة على تحقيق أهداف الحملة.