

Artificial Intelligence: A Technological Tool to Manipulate the Psychology and Behavior of Consumers: Theoretical research

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Disclosure Statement :	Authors are not aware of any findings that might be perceived as affecting the objectivity of this study and they are responsible for any plagiarism in this paper.
Conflict of Interest :	The authors report no conflicts of interest.
Cite this article :	LEMSIEH, H., & ABARAR, I. (2024). Artificial Intelligence: A Technological Tool to Manipulate the Psychology and Behavior of Consumers: Theoretical research. <i>International Journal of Accounting, Finance, Auditing, Management and Economics</i> , 5(6), 432-449. https://doi.org/10.5281/zenodo.12186137
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Received: April 10, 2024

Accepted: June 18, 2024

International Journal of Accounting, Finance, Auditing, Management and Economics - IJAFAME

ISSN: 2658-8455

Volume 5, Issue 6 (2024)

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Abstract:

In that emerging digital era, Artificial Intelligence technology headed by machine learning, digital-smart technologies as well as the Big Data that allows predictive analysis has a significant influence over many people precisely those who are not all conscious and aware that the datasets are assembled from their online interactions and activities, consequently it can be used to anticipate and manipulate their purchasing psychology and behavior out of their control. In these terms, this study is going to present the literature that is in relation basically with the approach to the contribution of the artificial intelligence technology in manipulating the purchasing behavior based on the psychological factor. To guide this in deep study we will include multiple sources of the secondary data, going from journal articles, conference papers, internet sources and so on. The main objective is to bridge and eliminate the gap in this somehow empty field of research. The theoretical conclusions will offer an insight about the main importance in terms of implementing the artificial intelligence tools in the field and the department of marketing as a successful way to understand the consumers preferences and their journey in terms of purchasing. The goal is to provide predictive analysis and to know precisely how to manipulate the psychology of consumers in order to influence their behavior. The generation Z are a real opportunity to achieve this aim since they are digitally native and most of their purchasing decisions occurs through the use of their smartphones as they rely on social media for collecting and gathering any kind of information

Keywords: Artificial intelligence, Consumer behaviour, Digital Marketing, Manipulation, Psychology.

JEL Classification: M31, M15, D91

Type du papier: Theoretical Research

Résumé:

En cette ère digitale émergente, la technologie de l'intelligence artificielle, dirigée par l'apprentissage automatique, les technologies numériques intelligentes ainsi que le Big Data qui permet une analyse prédictive ont une influence significative sur de nombreuses personnes, plus précisément les personnes qui ne sont pas toutes conscientes que les ensembles de données sont assemblés à partir de leurs interactions et activités en ligne, et qu'ils peuvent donc être utilisés pour anticiper et manipuler leur psychologie et leur comportement d'achat sans qu'elles puissent les contrôler. En d'autres termes, cet article va analyser la littérature relative à l'approche de la contribution importante de la technologie manifestée par l'intelligence artificielle dans la manipulation du comportement d'achat sur la base du facteur psychologique. Pour guider cette étude approfondie, nous incluons de multiples sources de données secondaires, allant d'articles de journaux, de documents de conférence, de sources Internet, etc. L'objectif principal est de combler les lacunes dans ce domaine d'étude. Les conclusions théoriques aideront profondément à présenter un aperçu sur l'utilité non négligeable relative l'usage d'outils d'intelligence artificielle au sein du département marketing comme un moyen efficace pour analyser et comprendre les préférences des consommateurs et leur parcours depuis le début et même avant jusqu' à la fin du processus d'achat. L'objectif est de présenter une analyse prédictive et de savoir précisément comment peut-on manipuler la psychologie des consommateurs afin d'influencer et diriger leur comportement. La génération Z est une véritable opportunité pour atteindre cet objectif car elle est numériquement native et la plupart de ses décisions d'achat sont prises à l'aide de son smartphone, car elle s'appuie sur les médias sociaux pour collecter et rassembler toutes sortes d'informations.

Mots-clés : Intelligence artificielle, Comportement du consommateur, Marketing numérique, Manipulation, Psychologie.

Classification JEL : M31, M15, D91

Type du papier : Recherche Théorique

1. Introduction

Nowadays the ultimate tool of Artificial Intelligence technology is being the discussion and core of focus in both academical research as well as companies' practice. This present article aims to examine the theoretical analysis to understand the ultimate use of artificial intelligence tools and devices in the domain of marketing in order to offer a well analyzing and understanding of the consumer attitude and behavior, since this seems to be increasingly important for consumer researchers.

Artificial intelligence is gaining more attention since this technology works on enabling and programming computers to become intelligent machines capable and automatized to think and mimic the human beings. The alliance of artificial intelligence, big data and marketing strategies makes it possible to analyze a huge number of data information in order to serve having a clear and in time consumer insights. Also, Artificial intelligence provides for businesses the ability to personalize their offers through analyzing the consumers preferences. Actually, the consumers data are gathered based on the consumers online interactions and behaviors from the one hand, and based on the data collected from the offline consumer information from the other hand.

The predictive analysis has helped significantly many companies to understand and identify their consumer behavior and consequently increase their financial performance and market competitiveness. The objective of this theoretical study is to provide a detailed and comprehensive research in the aim of shedding light on the increasing importance of artificial intelligence as a way to manipulate consumers psychology and behavior through understanding their purchasing journey. Enterprises have started increasingly using the technology of AI to understand and communicate with multiple consumers' behavioral patterns and to interact effectively with them. Amazon can be a good example of AI leading markets to present, the company has showed how this technology facilitates the consumer segmentation, personalization and also customer support.

Businesses within the artificial intelligence developers contribute and work hardly to improve the AI abilities and applications in order to enhance the consumer acceptance, use and more importantly the confidence in AI. All these requirements are gathered to achieve the objective of increasing the performance and efficiency of AI enabled business capabilities and at the same time addressing consumer concerns regarding the Artificial intelligence bad side, this includes matters relating to the protection of privacy and data confidentiality, algorithmic bias and handling of data. (Cheng & al., 2022; Mogaji & al., 2020).

The article will represent how marketers nowadays are enhancing their strategies through using artificial intelligence solutions in order to better understand and cartography the buying trends and purchasing comportment brighter than the way consumers make it for their own. In fact, marketers use machine learning algorithms to get the capability to provide more personalized suggestions and advertisements to different consumers. The artificial intelligence technology works on gathering multiple data and create based on its predictions for consumer possible behavior in order to enhance the desired reactions.

Our research starts by introducing the concept of psychology which refers basically on the analyze related to the brain or the mind and the way it impacts and drives peoples' behavior. Indeed, the intersection and alliance among Marketing, consumption behavior and psychology are built and gets back to historical findings in terms of economic models that was used in the aim to describe and clarify consumer choices shifting for a more focus in the aspect of theoretical psychological findings. Thus, the theories in the psychological fields are based on multiples different models derived and inspired from the social behavior psychology, education psychology, motivational psychology and then environmental psychology.

The advances and progresses surrounding the artificial intelligence (AI) technological solutions and its different ways of usages has radically manipulated and shaped the ways consumers behave. The study on the link between artificial intelligence within the purchasing patterns revolves important and centered all around these applications and has expanded rapidly in these recent last couple of years.

Future emerging technologies, headed by Artificial intelligence will help providing a vast variety of opportunities and options in the goal of clarifying how customer trends and attitudes change.

Many findings supported the idea that influencing and manipulating the consumers' internet and web purchasing behaviors necessitates in first a real complete explanation of their portfolio of factors. Indeed, Artificial intelligence technological tools is considered to be a practically useful way for attaining this goal, as they enable providing important information on a number of features that are impacting consumer purchasing and behavioral intentions. In addition, they actually offer performant tools which impact the final-consumer behavior through promoting and advertising effective product recommendations and personalizing the product or service suggestions.

Recently, artificial intelligence has been deployed extensively in the field of marketing to enhance consumer experience through in-depth learning. With increased competitiveness on the market, customer satisfaction has emerged as the key element of all marketing and business strategies. In addition, the particular attention and value of understanding psychological processes for the entire subject of AI seems to be obvious. Researchers that started investigating around the technology of AI had the eventual strategy of building machines which can perform in doing different tasks that, supposing accomplished through people, would need intelligence and inquiries (McCarthy & al., 2006).

In this article, we would like to illustrate some of the innovative insights into consumer psychology that have been and can be enhanced by using many psychological theories including the neurophysiological recent methods.

Also, in this last decade, the interest over the field of Artificial intelligence (AI), as a discipline has risen significantly. Artificial intelligence encompasses a variety of theories, methodologies, technologies, and tools envisaged to enhance the understanding and to increase the human intelligence by artificial methods (Andresen SL; 2002), that means that consumer behavior could be understood through artificial intelligence which can convert data into strategies (Haenlein & Kaplan; 2019). Introducing artificial intelligence in digital marketing may provide businesses the ability to select properly and target the adequate consumers in the optimal moment (Ransbotham, & al. 2017). The rapid growth seen in information technologies, such as IT in the cloud computing, the Internet of Things (IoT), the supply of big data, and the ultimate technology of artificial intelligence (AI), is a real revolution of the innovative manufacturing system by transforming every stage of product lifestyle management (Tao F, Qi Q; 2017). Through the continuous fluctuating dynamics in digital marketing, access to information has become so easy for brands so as to know a lot about their customers and to control the consumer behavior (Dwivedi, & al., 2015). Actually, these dynamics consist of matching advertisement and personalizing things for each customer identity and interest (Tran, 2017). Within the help and continuous support of algorithms, the tool of artificial intelligence enables machines to mimic the human intelligence through supporting them, AI-headed by algorithms provide automatic systems and machineries the empowerment to take decisions, detect patterns and extract helpful findings (Rodgers, 2020). Either in machine or deep learning, advanced algorithms are considered to Contain a range and an assembly of standards and regulations incorporated inside an AI-powered program to facilitate independent learning.

Moreover, shedding light and exploring the Artificial intelligence as a primordial form of technology can promote understanding and visualizing its relevant contribution on the realm of

digital technology. In fact, the Artificial intelligence technology is still maturing and advancing since its introduction in 1956 with John McCarthy. In the given context, the implementation of Artificial intelligence technology in the marketing field is definitely helping companies to enhance the productivity and improve the customer experience through data collection and analysis. In this review article, the research Will focus on understanding how the artificial intelligence tool is able to manipulate the psychology of consumers and then Impact their behavior and intentions, in addition, this research will project the applications of AI in the pillars of digital marketing, importantly the product development, the customer experience and how AI is Revolutionizing Personalized Advertising. Finally, this study aims to shed light on some algorithms used to enhance the digital marketing experience.

2. Artificial Intelligence Technology: A Real Manipulation of Consumers' Journey

2.1 Artificial Intelligence and the Psychological Influence

Studies in the field and domain of psychology have emerged years ago as an important subject of research to analyze deeply and investigate more on the behavior of people in the marketplace specifically in the marketing discipline (Alderson, 1952). In fact, the core of consumer behavior studies and Marketing investigations remain in the research related to the psychological theories. Psychology is a science that focuses on analyzing and understanding the mechanisms of the mind and how it influences our daily actions and attitudes, it could be presented through different concepts going from communication, memorizing, making decisions, perceiving thing and also it integrate an emotion part (British Psychological Society, 2021).

One of the theories that explains and links the psychology to people behaviors is the philosophical contribution of the planned behavior theory, it affirms that it contains three main considerations that influences a human behavioral attitudes approach : the attitude outlook around the behavior, descriptive or subjective standards within the what is called perceived behavioral control, and finally the intention is the real strong part of the behavior (Ajzen, 1991). To deepen this theory, Kowatsch and Maass (2010) suggested a model that links both the Theory of Planned Behavior (TPB) from one hand and the Model that treats the Technology Acceptance (TAM) in the aim and vision to analyze how the use of the mobile technology proposition and suggestion agents impact the intentions. This framework explains how the human intentions as well as the subsequent behaviors through the use of technology are affected by their attitudes, descriptive norms, and self-assessed and perceived controlling behaviors as well as how the two components of TAM specifically usefulness and ease of use are perceived. Through combining these theories and frameworks, Kowatsch and Maass wanted to introduce a comprehensive understanding of the main factors that enable driving implementation and usage of MRAs, store preference, and purchase behavior.

Furthermore, the ability to understand, interpret and predict others behavior is a fundamental aspect in the cognitive psychology, actually the theory of the mind is basic feature of the social cognition (Baron-Cohen, 1995). The cognitive psychology aims to provide a comprehension to the set of processes as well as functions of the human mind that enable and help an individual to give attribution of mental states to others such as beliefs, intentions, desires and emotions. In addition, the theory of the mind cartographies both psychological and mental components and has been a core main research surrounding the emergent domain of artificial intelligence since it posits how can the mind be a large important range of multiple materials in both inorganic and organic (Steele, 2002)

Artificial intelligence remains really contributing and focusing more on 'the cold' cognition', thereby, it enables extracting information from a huge amount of data. especially how to extract

information from data. Artificial intelligence has been applied many times in the game of theory. Actually, this theory aims to understand different situations in order to explain how decision makers interact (Osborne, 2004). For instance, machines are very good, and even extremely better than humans, when it comes to playing strategic games such as chess.

Artificial intelligence has been applied in different ways in the game theory. The main objective of this psychological framework theory is to provide algorithms and many models that may help analyzing multiple possible scenarios and make predictions about possible decisions. This goal is achieved through the use of machine learning techniques and algorithms for providing well defined statistical analysis of datasets.

Thus, the game theory could be combined to understand more the behavioral and decision-making intentions by providing situations where the one player's choices are related significantly to another player's choices. The application of this field was spreading in various disciplines such as politic, economy, sociology and so on. With the introduction of artificial intelligence technology, it has become possible to enhance the behavior of artificial agents and improve as well the game strategies.

Moreover, we can introduce a new concept which is the concept of neurophysiology that has entered to manifest new additional features of insights into the field of psychology and dimensions that impact the behavior. In this way, many recent foundational research works in the domain of consumers neurosciences have investigated how the creation of value within different marketing concepts are defined and projected in the brain, consequently; the emergence of this field has expanded in order to present more advanced measurement of how consumer interact and response to pricing, branding and many other different marketing factors and components (Smidts A, ,2014; Plassmann H, Karmarkar UR;2015)

Actually, many emerging and consistent innovations have been applied to allow not only understanding but also modeling and managing consumer behaviors. In this same area of consumer neurosciences, the most promising part which enables providing insights is related to affect or emotional feedbacks and answers

Thereby, neurophysiological measures make it possible to analyze and comprehend how can the consumer emotional attitudes and feelings change over time as well as if they are or not implicated in the process of decision (Teixeira T & al; 2012).

In this way, the understanding of the human psychology is a primordial step to analyze its interactions, emotions, attitudes and way of thinking. Actually, the psychological field remains a basic discipline for marketers to learn in order to understand consumers and influence their decision-making process. Thereby, the artificial intelligence is a practical technological tool that still spreading and makes it possible for marketers to analyze and make use of a huge amount of data in order to synthesize the psychological data of consumers and know how to interfere and target people for manipulating their behavior and decisions.

2.2 AI Impacts the Consumer Behavior and Decision Making

Consumer behavior is an essential domain of research since it is concerned by exploring and creating different knowledges to discover and enable understanding how the artificial intelligence technological tool and consumer behavior influence and impact each other. This research study is relevant to improve the investigations on the artificial intelligence and its combination with consumer behavior shaping process.

Also, artificial intelligence technology is considered to be valuable when it is combined with the behavioral Research studies in order to be used for modelling and treating consumer attitudes and for enhancing and improving this behavior (Ludwig & Mullainathan, 2022).

Actually, artificial intelligence tools are mostly used to create a more individual and well targeted online advertisements as well as recommendations in order to influence consumers intentions and preferences and drive their products and service consumption, in fact, this is

called nudge marketing, this concept means Influencing and creating manipulations to drive choices and make consumers affected to influence their choosing process.

Thereby manipulation happens through a well-defined design strategy, online marketing tactics and finally a kind of predatory convincing.

In fact, the well estimated predictions and anticipations within a deep comprehension of consumer behavior has been real step to enable companies developing and enhancing their revenue and to make them get a very competitive place (Krakowski & al., 2021).

Nowadays companies start using artificial intelligence technologies to analyze and understand most of consumer behavioral patterns and interact with it. As an example, we could present the firm of Amazon which is considered to be a leader in artificial intelligence technology usage since it has deployed it in different and multiple services such as segmenting consumers, providing recommendations and supporting (Transperfect Media, 2017).

In addition, artificial intelligence tools seem to be an optimal way helping to achieve and change consumers online purchasing behavior process through understanding deeply their range of factors that drive their buying. Thus, this technology helps presenting and providing many relevant information and aspects that influence customers' behavioral intentions.

Most of early researchers in the field that links between artificial intelligence and consumer behavior have focused more on subjects that explain how artificial intelligence and specifically the big data concept may help understanding and analyzing consumption journey behavioral insights (Dinu & al., 2016; Lichy & al., 2017) as well as clarifying the issue related to the adopting and the acceptance of the artificial intelligence tools (Huang & Qian, 2021; Prentice & Nguyen, 2020).

It is really important to present and discuss how consumers get manipulated through their decision-making process after using technologies like voice agents' companions (Dellaert et al., 2020), autonomous automobiles and cars (Gill, 2020), proposition and targeting protocols (Banker & Khetani, 2019), robotically mechanical systems (Granulo & al., 2021). Consumers choose to adopt an artificial intelligence technology based on many factors such as the perceived used, consumer value, and other psychological factors like the desire to be unique or the risk aversion.

The consumer adoption or acceptance of artificial intelligence vary in many different applications like chatbots assistancy (Lee & Park, 2022), smart and clever speakers (Ling & al., 2021), Generative Adversarial Networks GANs; (Sohn & al., 2020), artificial intelligence service agents (Lalicic & Weismayer, 2021), and voice assistants (Hasan et al., 2021). These multiple applications happen through using different technology tools such as voice recognition, Natural language processing (NLP), image recognition and finally deep learning (Kietzmann & al., 2021). All are gathered to help and interact in the consumer purchasing journey through presenting different recommendations, promotional advertising content, a well-defined global information and customer service assistance (Klaus & Zaichkowsky, 2020). The main objective and goal of analyzing Datasets is to provide prediction models related to purchasing motivations and buying decision-making process within each individual (Pfeiffer & al., 2020), presenting a rich framework in order to define the dynamics and rhythms of a heterogeneity at each consumer level (Dew & al., 2020); and finally using diverse communication methods for convincing and negotiating at a consumer stage (Jeong & al., 2019).

Moreover, understanding consumer behavior depends on answering customers in a very changing and dynamic environment by making prediction on future customer possible behavioral attitudes (Kitchens & al., 2018) minimizing the customers perceived purchasing threat (Ketzenberg & al., 2020) and addressing customers through their anticipated churn interaction and responsiveness to products offer or services (Lemmens & Gupta, 2020).

Artificial intelligence enables individualizing recommendation promotions based on the purchasing history of the consumer as well as the opportunity costs related specifically to advertising and recommending (Fong & al., 2019), as well as the customers' successive failure choices and selection of contemporary products (Anderson & al., 2015).

In fact, building a strong Consumer-brand relationship is principally based on switching from the one-to-many mass communication to highly well targeting customized one-to-one communication (Matz & al., 2019). Analysis includes also the consumers profiles for providing personalized mechanisms based on the analysis of search and click of users' history (Yoga Narasimhan, 2020), structural econometric model to facilitate and enable understanding consumers' preferences and costs on search engines to enhance the consumer experience based on the unstructured social media patterns (Ghose & al., 2019). Also, it is essential to affirm that decision rules' investigations provide multiple techniques to predict which product consumer may choose and select (Hauser & al., 2010). Indeed, many algorithms have been used to create statistical models to anticipate the future and the dynamic economic conditions in the goal of making tactical clever decisions like the price of a product and also strategic decisions related for example to the inventories of finished goods (Ketter & al., 2012),

It is important to mention that by the year of 2025 the service interactions among either consumers or employees are vastly expected to be changed into an artificial intelligence service interaction with consumers (Forbes, 2018). Thereby, the studies related to the degree of trust of technologies have conceptualized and defined the human and technology interacting relation (Wang, Qiu, Kim, & Benbasat, 2016).

The decision-making process is concerned by the dual process theoretical approach (Khan & al., 2020; Stanovich and West, 2000), where the cognitive part would be explained through two important features viz ; the rational cognitive category which reflects the utilitarian value perception and the irrational emotional category which refers to the hedonic value perception. Researchers confirmed and Scholars argued that one-sided study of cognitive or emotional aspects can overlook precious and valuable differences (Yuan & al., 2021).

In other words, the dual process framework introduces two important paths that divide the human cognitive process and that are called "system one" and "system two" (Stanovich and West, 2000). The first system aims to present the irrational part or what is called the emotional responses, and the second one stands for the rational part that represents the cognitive perceptions (Khan & al., 2020; Yuan & al., 2021)

Many researchers have affirmed how can the value perception influence and drive the users' technology acceptance, in fact, it aims to give a reflection of how the product performance is perceived and viewed by users (Lee & al., 2007). Actually, the utilitarian motivations are the most considered by users before deciding to buy technical products. However, in comparison with the general services, the technology of artificial intelligence plays a significant role in terms of solving difficult issues and personalized problems through a plethora of algorithms in order to provide a clear detailed technical system information (Ameen & al., 2021; Guha & al., 2021; Tsai & al., 2021). In other cases, many studies confirm that the hedonic experience takes place when the users benefit from other features such as emotional relation with products and brands and don't look for any utilitarian value (Babin & al., 1994). Gursoy & al. (2019) explain that users utilize artificial intelligence components within the hedonic motivations, finding that AI assistants are a new development and element of an evolving consumer journey (as distinguished from typical or classic purchasing experiences), whereas many others appreciate the communication or simply fulfill their own curiosity. or satisfy their curiosity (Fryer & al., 2017; Hasan & al., 2021).

In more, researchers have introduced the concept of anthropomorphism which refers to a relevant is a significant a key influencer among AI adopters (Ashfaq & al., 2020). Indeed, People have a tendency to anthropomorphize items and things, in spite of the fact that a certain

number of AI tools have their own unique humanoid aesthetic, consumers often associate attributes, emotional or behavioral characteristics with the object themselves, thereby driving forward subsequent reactions and responses (Pelau & al., 2021).

Another framework was suggested by Mehrabian and Russell (1974) namely the Stimulus–organism–response framework which aims to explain that the external stimuli impact behaviors via the agency of both the cognitive and affective organizational states (Jacoby, 2002; Mehrabian & Russell, 1974). In fact, the three main aspects of the approach SOR frames define the stimulus (S) as an externally imposed environmental parameter which a person encounter. The stimulus can involve the organism (O), as described by the individual's state of internal cognition and emotional state. The Response (R) designates the outcome of behaving in reaction to an outward stimulus. Thereby, the SOR framework is considered as a theoretical explanation for individuals' behavior within the online landscape (Animesh & al., 2011; Song & al., 2021; Soroya & al., 2021; Xu & al., 2014; Zhang & al., 2015). As an example, Cao and Sun (2018) through using the SOR framework analyzed the influence of overwhelm on the psychological processing of social media consumers that is, exhaustion and disappointment, and the subsequent discontinuous sense of intentionality. Also, Zhang & al. (2014) used the SOR approach to understand and analyze how the technologically innovative components of social commerce platforms have an impact over consumers' virtual experiences and their willing to contribute and be a part of in social media.

Consequently, the consumer behavior and decision-making process is a significant field of study that marketers may consider to improve their competitiveness, thus, the deployment of the artificial intelligence technology plays a very huge role to analyze deeply the consumer journey and to target smartly those consumers in order to affect their rational and irrational systems. In this way, considering artificial intelligence tools is a real opportunity for companies to manage well their consumer experiences and satisfaction.

3. The Contribution of Artificial Intelligence to the Marketing Landscape:

3.1. Developing Products in the Era of AI:

Nowadays manufacturing companies and organizations does not only take into consideration the factory floor, otherwise it considers the product improvement arena too (Abegglen & Stalk, 1985; Stalk, 1988; Nonaka & Takeuchi, 1995). The enhancement and emergence in the domain of information technologies helped transforming the product lifestyle management (Tao F, Qi Q ;2017). The Product development cycle takes and follows various steps that enable organizations to discover and explore data in order to translate it to market opportunities and technical functionalities into valuable information assets for serving the department of production (Clark & Fujimoto, 1991). Some of the investigators implemented the artificial intelligence technology within smart home systems in the goal to have a complete control and manage for example the lightning and the temperature inside home (Crisnapati, P.N & al ;2016). In contrary to the non-automated manual market research, the data mining market analysis is capable of detecting thanks to machine learning and statistics the data's implicit correlation (Zhang Z, & al 2015).

Santillan-Gutierrez and Wright (1996) assert that the conceptual and embodiment stage during the product development process is considered to be a critical stage. Consequently, the authors suggested an approach that may help the designer throughout the end of the conceptual process. This approach actually relies on employing genetic algorithms (GA) and other traditional techniques in order to identify possible solutions. Decision intelligence like the Rough Set Theory and the Fuzzy Theory are integrated to support decision making processes, also incorporating heuristic algorithms are demonstrated to search for the best layout design that

meets the desired quality and functionality criteria (Zha S, & al 2017). Actually, the intelligent CAD computer-aided design software aims to suggest guidance for design characteristic and parameter recommendations for designers by incorporating both traditional CAD system as well as expert systems (Zhang Z, & al 2015). Park and Khoshnevis (1993) proposed a system named Real-time Computer-aided Process Planner (RTCAPP), the system is considered to be a computer aided process planning system that provides a design prismatic part and the manufacturing processes too. The Real-time Computer-aided Process Planner (RTCAPP) suggest a real time manufacturing cost feedback of every single added design characteristic so as to help designers choosing the most appropriated cost design that meet the desired product Performance criteria.

In the same vein, Human-robot collaboration has emerged as an advanced manufacturing field offering a high automation, flexibility, and productivity so as to complete various Assignments (Djuric AM, & al 2016). The integration of AI provides to the traditional Manufacturing Execution System MES a powerful and advanced decision-making ability in comparison with human so as to be able to get an active management (Huang GQ, & al ;2008). The joint use of deep learning and recommendation algorithms can improve the level of personalized decision making in terms of recommendation by filtering and examining data information related to user set and product set (e.g., DNN + collaborative filtering) (Betru BT, & al ;2017).

Product Development in the Age of Artificial intelligence optimize the product performance as well as it improves decision making. Companies have become able to streamline their product design and offer a more personalized experiences for customers through using big data and predictive analysis to identify new opportunities.

3.2. The Power of AI to Increase Customer Engagement:

The way digital marketing interacts with customers is undergoing a radical transformative revolution thanks to the implementation of Artificial intelligence (AI) (Ransbotham & al. 2017). Through this process, advertisers will have the capability to evaluate the demands of potential customers and adapt AI-based digital marketing campaigns to maximize sales (Campbell & al. 2020). Personalization in its high levels along with prioritizing the improvement of digital marketing mechanisms will be accentuated (Keiningham & al. 2017). The use of AI technologies assists service providers to be able to handle and respond to a massive data instantly by digitizing the service interactions as well as delivering personalized customer experiences (Bettencourt, Lusch & Vargo 2014).

In the context of online businesses, AI is often closely associated and commonly seen in various digital marketing popular technologies including the augmented-virtual realities, the vision-driven imaging, and also the called predictive inventory management (Singh & al. 2019). By analyzing customer profiles and information, Artificial intelligence devices offer guidance to suggest appropriate customer interaction strategies in the digital marketing arena (Ransbotham & al. 2019). "Data capture," stands for multiple techniques from acquiring, collecting, and extracting data from various sources to be processed by Artificial intelligence systems. Also, Artificial intelligence can capture data through what is called the shadows; such as facial recognition technology that can capture data about a shopper's gender, age, and mood left by consumer behavior when they engage in daily activities or an iRobot Roomba vacuum cleaner which can collect data creating a graphical representation of the layout of a home (Kuniavsky 2010). The forecasting potential of Artificial intelligence is exploited by companies leveraging the predicting capability of this artificial intelligence to achieve a hyper personalization and enhance engagement, relevance, and satisfaction levels (Kumar & al. 2019). Using the artificial intelligence technology, and considering individual and collective viewing histories alongside contextual factors such as device, location, and time, Netflix suggest tailored and individualized movie recommendations (Kathayat 2019).

Through delegation experiences that rely on Artificial intelligence, the consumers feel strengthened in two specific ways by avoiding tasks that the AI handle for them and by avoiding the engagement in the tasks the AI could be able perform efficiently on their behalf, consumers in the process of delegation experiences can feel supported in two distinct ways. From the one hand, consumers are potentially allowed to reduce the work schedule and experience the joy of leisure moments since they become free up toward activities that bring greater satisfaction and significance (Fishbach & Choi 2012), from the other hand, consumers can enhance their work performance and derive increased joy by delegating externally driven tasks to AI while preserving intrinsic tasks for personal fulfillment. (Botti & McGill 2011). The potential for Artificial intelligence to participate in mutual communication generates what we define as a "social experience". In addition, the evolution noticed over social robotics is providing the production of AI-based service communications that can be pleasant and possess the potential for emotional significance (Van Doorn & al. 2017).

A study conducted by (Kumar,T & Trakru,M; 2020) highlights that Artificial intelligence empowers e-commerce with new avenues to fulfill consumer demands and respond to their dynamic preferences. Also, Soni's (2019) research demonstrates the implementation of Artificial intelligence in e-commerce platforms plays a decisive role in enhancing their overall customer service experience (Soni, V.D.;2019). The acquisition of AI technology in e-commerce is intended to enriching customer satisfaction by creating more streamlined and effective systems that bridge the gap in terms of interactions and communication between businesses and consumers (Soni & al; 2019). Thereby, deep learning is considered to be a significant way through which the demand predictive process is optimized (Ren, S & al; 2020). The insights provided by the artificial intelligence technology can empower businesses to reach a profound appreciation of their customers' needs and preferences enabling them to tailor their strategies more effectively (Morgan, 2018). In that way, Legget confirm that many different businesses have tended to integrate the AI Technology so as to touch up efficiently the personalization of customers experiences.

Artificial intelligence (AI) technology has come into view as an effective instrument to enhance customer experience through offering more personalized communication and interactions. AI algorithms aim to help detecting patterns and preferences by allowing companies to analyze a vast amounts of customer data in just a real time. Thereby, Artificial intelligence may allow a high customer satisfaction and engagement that induct to increase performance of businesses.

3.3. AI Breaks New Ground in One-to-One Advertising:

Online behavioral advertising (OBA) involves the process of monitoring the actions of internet users and analyze the collected data to present customized advertisements (Boerman, & al. 2017). Machines' ability to execute tasks in accuracy and effectiveness with continued performance falls under the scope of Artificial intelligence (AI) technology (Williams, 2018). It is actually proposed that collecting and analyzing consumers' data by the help of artificial intelligence facilitate the well understanding of every single consumer. Beyond the current insights into customer behavior big data analytics can offer numerous perspectives (Datameer, 2018). Actually, Programmatic advertising can be enhanced, improved and quick with the aid of AI (Faggella, 2017), using predictive analysis to anticipate consumer behavior enabling targeted advertising to be delivered proactively. Indeed, the most relevant step in the advertisement strategy planning is to provide personalization (Rosen, 2012). Advertisers seeks to enhance a morally sound apparatuses and collect the online demand by utilizing AI as it is esteemed to be the principal demand among the e-commerce atmosphere and can Boost web commerce platforms (Qin & Jiang, 2019).

The evolution of digital marketing has undergone three phases: interactive advertising as the initial phase, programmatic advertising as the second phase and the third phase showcasing

intelligent advertising (Li, 2019b). The use of interactive technologies is becoming increasingly indispensable to marketers, this refers basically to techniques, tools and mechanisms that permit different entities (individuals, machines, or organizations) to employ mediated communication so as to make easy going the planning and execution of transactions between different parties (Varadarajan & al; 2010). Interactivity has the potential to boost the effectiveness of advertising (Johnson ;2000). Likewise, Programmatic advertising is described as having two essential components, the use of a creative platform (PCP) and a content management platform (CMP), these two tools are designed to simplify the creative process that is centered around consumer data and programmatic buying (Chen & al. 2019), this integrate data management platform (DMP) alongside with a demand-side platform (DSP), the combination aims to offer a solution of identifying the optimal match between a relevant advertisement and a particular user in a specific context (Broder, 2008). AI-based algorithms can improve intelligent advertising by facilitating the incorporation of personalized recommendations for users based on capturing their preferences (Li, 2019) or voluntary exposure to the user (Li & al., 2002, 2003). By our definition intelligent advertising involves brand communication that centers on the consumer, data-driven decision-making, and utilizes algorithms to deliver personalized content.

Artificial intelligence (AI) is revolutionizing personalized advertising by analyzing vast consumer data through AI-powered algorithms to identify patterns and preferences. This enables more efficient targeting of relevant content, thereby it enables advertisers to tailor content to individual users' needs and interests. AI technology advancement will surely lead to more precise and sophisticated personalized advertising creating new opportunities for brands to interact efficiently with their audiences

4. AI Algorithms for Enhanced Marketing Performance:

4.1. Important Machine Learning Tools to Know About:

Due to their capacity to analyze vast amounts of data and detect patterns which are challenging for humans to identify, machine learning algorithms are gaining prevalence in marketing. Random Forest is a popular, powerful and versatile tool for predicting customer behavior based on past interactions with a brand. In the field of machine learning the Random Forest algorithm is widely renowned for its accuracy and efficiency in making predictions considered to be superior to other machine learning models in many applications (B. Yu, H. Wang, & al ;2018). Another algorithm, Gradient Boosting that is considered to be a strongly powerful algorithm it has spread largely to becoming the most used technological tool in machine learning thanks to its ability to examine customer datasets in order to produce and generate personalized product recommendations. "Gradient Boosting Algorithm (GBA) is one of the most powerful algorithms in predicting results from data. This algorithm has been proven to increase the accuracy of predictions and is becoming increasingly popular among data scientists". (<https://vitalflux.com/gradient-boosting-algorithm-concepts-example/>)

Other machine learning algorithm that is a popular choice among marketers, this algorithm has proven effective in identifying similar customers and can be used to create targeted marketing campaigns. Using web usage data mining techniques, the K-Nearest Neighbor (KNN) classification method has been used in real-time applications to identify user groups based on their clickstream data and recommend tailored browsing options that goes with consumers need at a real time (C. Padraig, J.D. Sarah; 2007). Final popular algorithm example to present is the Support Vector Machines algorithm, which can be used to provide a classification of customers through their past behaviors and choices. Successful application of SVMs has been proven in the domains of pattern recognition tasks, static function approximation, and regression (C. Burges; 1998), also SVM has been employed for time series prediction with showing a promising result (K. Muller, & al ;1997).

Machine learning algorithms are increasingly being used in the marketing field for customer segmentation, content personalization, and advertisement optimization. These algorithms are capable of analyzing a very large volumes of data to detect patterns and insights that can enhance targeting leading to a higher customer engagement and ROI.

4.2. Important Deep Learning Tools to Know About:

Deep learning, which is represented as a branch of machine learning engages artificial neural networks comprising multiple layers. An effective marketing strategy can be achieved through this powerful tool by scrutinizing customer behavior predicting future trends, and optimizing marketing campaigns. Our discussion in this article will provide insights into some deep learning algorithms that are frequently used in the marketing.

One of the most prevalent techniques employed for tasks such as image recognition and classification is Convolutional Neural Networks (CNNs). By applying CNNs in marketing, it is possible to analyze images and videos to find trends and patterns. Actually, CNNs may be employed to analyze social media images and videos, the main goal is to be able to detect customer preferences and behavior. CNNs are being extensively utilized across multiple domains due to their outstanding performance (Wang, J., Lin, J., & Wang, Z.; 2016) such as image recognition and classification, object detection, face recognition, speech detection, facial expression detection and many more.

Equally important, Schmidhuber's 1993 presented a machine learning algorithm based on consumer behavior prediction model (Schmidhuber, J; 1993), recurrent Neural Networks (RNNs) find extensive applications in the fields of natural language processing and speech recognition. RNNs can be used in marketing to analyze customer opinions and feedbacks, the main goal is to generate personalized marketing messages based on customer behavior analysis. Besides, the Generative Adversarial Networks (GANs) algorithm is frequently employed for image and video generation. Essentially, marketers may provide GANs to realize realistic images and videos for marketing advertisements as well as generating personalized product recommendations for customers. The GANs is commonly used and implemented for solving a multiple of tasks such as generating images from descriptions (Arjovsky M, Chintala S, Bottou L ;2017), generating a higher resolution image from one or more low-resolution input images (Bulat A, Yang J, Tzimiropoulos G ; 2018), Object recognition and detection (Everingham M, & al; 2010), finding images that contain a specific pattern (Mathieu M, Couprie C, LeCun Y; 2015), manipulating Facial Attribute (Kaneko T, Hiramatsu K, Kashino K; 2017), generating Anime (Jin Y, Zhang J, Li M, Tian Y, Zhu H, Fang Z; 2017), translation of images from one form to another (Huang X, Liu MY, Belongie S, Kautz J; 2018) and so on.

Through the advancement of deep learning algorithms, businesses can make more informed decisions, improve customer engagement, and ultimately drive more revenue.

5. The Future of AI in Marketing:

Through AI technologies, marketers have become able to generate a personalized advertisement, make right decisions at a real time, evolve human creativity, optimize voice search content, and automate customer service. As AI technologies become more advanced, they will be able to provide a highly personalized experiences for customers engagements. Indeed, Through the analysis of customer behavior data businesses can offer targeted advertising, customized product recommendations, and personalized pricing. A Research by Ascend2 reveals that only a small fraction of 9 percent of marketers have formulated a hyper-personalization approach. As Garcia (2020) reports, the implementation of hyper-personalization is still being discussed for around 62 percent of marketers and have not yet taken steps to implement it. Also, AI-powered systems will help marketers to be able to decide

at real time through customer data behavior. According to Claudé and Comb (2018), AI is mainly utilized as a tool to assist in significant business decision-making, rather than being the decision maker itself, which is considered relatively weak in contrast to the anticipated capabilities of future strong AI.

While there is a doubt and fear that AI will replace the human creativity in marketing, others consider that AI will in fact help to touch up the human creativity by enabling and creating new inspiration. AI tools are capable to help marketers in terms of detecting new trends, identifying novel ideas, and even suggesting creative solutions. Not only that, however with the continuous growing of voice assistants such Amazon Alexa and Google Home, marketers are challenged to enhance their content for voice searching. Actually, AI-powered voice recognition tools will create a natural language processing, helping marketers to create content that is refined for a better voice searching. Personal voice assistant technologies and speech recognition have been identified as one of the most critical areas of marketing research, these technologies offer a flexible interaction technique enabling users to participate equally with the system facilitating in ensuring precise and unambiguous answers to web queries (Kanagarajan K, Arumugam S; 2018)

As AI becomes more frequent and relevant in marketing, there will be an increasing need for ethical and transparent practices. Guidelines that encompass various aspects such as data privacy, security and as well as regulations governing the application of AI in domains such as bias and discrimination. The best option is -to develop AI systems that align with ethical principles (Anderson, M., Anderson, S.L;2007).

Furthermore, AI-powered chatbots and virtual assistants will surely become very common in customer service, helping businesses to provide 24/7 support to customers. chatbots function as virtual agents answering customer inquiries 24/7 instead of a human staff (Larivière & al., 2017). AI technologies will play a heavy role in assistance through freeing up human customer service agents to center their focus on hard and complex issues.

The future of AI in marketing seems to be promising. AI-powered tools such as chatbots, recommendation engines, and predictive analytics are already transforming the industry. As AI technology continues to advance, we may expect even more sophisticated and hyper-personalized marketing strategies that will enable better customer experiences and enhance ROI for businesses.

6. Conclusion:

The relation and convergence between both the artificial intelligence (AI) and the field of consumer psychology has opened up for new emerging perspectives in the digital marketing. This article has demonstrated how Artificial intelligence technology is transforming and shaping the consumer attitudes and behaviors, as well as influencing their decision-making processes. The analysis of massive number of datasets through artificial intelligence algorithms enables an in-depth understanding of each individual preferences and common trends, furnishing marketers with powerful tools to personalize consumer experiences. Utilizing techniques such as machine learning and natural language processing, enterprises can forecast consumers' needs, anticipate their potential reactions and manage their strategies to adapt it accordingly.

Embodying artificial intelligence devices into the digital marketing field is transforming the way businesses approach customer engagement and experience. From product development and customer engagement to personalized advertising and campaigns, Artificial intelligence is revolutionizing and transforming the marketing industry. With the use of Artificial intelligence algorithms, companies are enabled to analyze large amounts of data in real-time so that businesses can gain valuable insights into their customers' preferences, behaviors, and

purchasing patterns, helping them creating a well targeted and effective marketing campaigns. As the use of Artificial intelligence continues to grow and evolve, we can expect even more innovative applications and technologies in the future of AI in marketing. Embracing AI in digital marketing can help businesses stay ahead of the competition and meet the ever-changing needs of their customers.

However, it is essential to recognize and consider the ethical challenges within the social implications of the growing use of Artificial intelligence technology in marketing. Potential consumer manipulation, safeguarding privacy and algorithmic bias are serious worries that call for constant vigilance.

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