



The Role of Digital Marketing in the Relationship between Artificial Intelligence and Customer Engagement

"An Analytical Study of the Opinions of a Sample of Online Banking Clients"

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Abstract:

The study aimed to identify the role of digital marketing in the relationship between artificial intelligence and customer engagement from the point of view of online banking clients (384 individuals) and determine the extent to which personal variables affect the attitudes of the study sample. regarding the study variables, the questionnaire was used as a tool for collecting data.

The data were analyzed using the statistical analysis program (SPSS 25), and the most important results reached by the study are that there is a statistically significant positive correlation between study variables. There is a statistically significant positive impact of artificial intelligence and its dimensions (neural networks, expert systems, smart agents, and genetic algorithms) on digital marketing and customer engagement. There is a statistically significant positive impact for digital marketing on customer engagement. There is a statistically significant positive impact for digital marketing on the relationship between artificial intelligence and customer engagement from the point of view of online banking clients with a confidence level of 95%.

There are no statistically significant differences in the average responses of respondents about study variables due to gender, while differences are realized due to educational level with a confidence level of 95%. In light of these results, we should employ artificial intelligence to customize offers and services based on each client's needs.

Keywords: Artificial Intelligence, Customer Engagement, Digital Marketing

Introduction:

Globalization has been associated with a state of economic conflict surrounded by digital conflict, especially in marketing and sales issues, which has made marketing rely extensively on communication technology in various marketing activities. Artificial Intelligence technology is considered a technological outcome for human development in the future, as Artificial Intelligence works to change traditional work methods, especially in light of the emergence of Internet of Things devices and advanced Artificial Intelligence technologies. With the enormous analytical capabilities of artificial intelligence and the advantages of long-term work. It will work for transformation (Al-Asdoudi & Nabil, 2023).

Digital Marketing is one of the new approaches to marketing, supported by digital elements that have their own characteristics and driving forces. Special methods that ensure the implementation of the marketing function through effective tactics and strategies support communication with marketers to obtain information regarding products, services, and offers easily and conveniently (Reddy, 2017).

The customer engagement concept is intended to increase the time or attention a customer or prospect gives to a brand on the web or across multiple channels. In response to a post that engagement was not a metric that anyone understood, it rarely drove action or improvement at the website, and contended that Customer Engagement encompassed various dimensions: product involvement, buying recurrence, administration interactions recurrence, sorts of interactions, online conduct, referral conduct/intention, and velocity (Bansal& Chaudhary, 2016). Hence, the present study is seeking to evaluate the impact of artificial intelligence on customer engagement through the role of digital marketing as an analytical study of the opinions of a sample of online banking clients.

Research Problem:

The benefits of using artificial intelligence outweigh its risks, especially in business applications. At this time, institutions are also facing rapidly changing technological development, and this problem appears clearly in the banking sector, which has not reached the required level of knowledge and understanding of digital marketing tools to enter this field. We notice, in a simple way, a deficiency in knowledge and a lack of sufficient understanding of the requirements of digital marketing and the techniques used. In the banking sector, and in order to advance the marketing department and thus advance the bank as a whole in support of customer engagement.

The researcher reviewed the reports published by the official authorities in Egypt on online banking; this stage resulted in the following:

- Most Egyptian banks have moved from the facility of traditional banking services to online banking services (Anouze& Alamro, 2019).
- Banks are leveraging fintech to maintain their market dominance against intense market competition from non-banking services (Wagdi & Fathi, 2023).
- The Central Bank of Egypt (CBE) has acknowledged that several challenges hinder the expansion of the digital financial services sector in the nation (Abdou, 2023).
- The CBE has released internet banking regulations for its instant payment network (IPN) inside Egypt, with the aim of improving access to online banking services and attracting more unbanked clients¹.
- In Egypt there is a great opportunity to expand in retail banking activities due to the rapid development of IT networks and telecommunications (Tooma& Grosser 2005).
- The share of the Egyptian adult population using a mobile phone or the internet to send money was minimal. As of 2024, only 2.6 percent used online banking in the past year. That year, more men used a mobile phone or the internet to send money at 3.6 percent, compared to 1.6 percent for Women².
- As part of the comprehensive digital transformation, the CBE has begun preparing for the establishment of a clearing system for checks in the form of electronic checks to start work in the second half of 2023.
- CBE issued the third version of the “rules regulating the provision of payment Services Using Mobile Phones” in April 2021, governing the provision of digital lending and savings services through a mobile phone wallet.

¹ CBE Report of rules regulating services for Instant Payment Networks inside the Arab Republic of Egypt, October, 2021

² <https://www.statista.com/statistics/1375994/share-of-people-using-mobile-phone-or-internet-banking-in-egypt-by-gender/#statisticContainer>

- In addition to the existing services in the mobile phone wallet, such as: cash withdrawal and deposit, receiving remittances from abroad, donating to charitable organizations, paying traffic services, booking tickets, and many similar services, transferring funds, and recharging the mobile balance.

The researcher conducted a pilot study on a sample of online banking clients where the study sample consisted of 40 clients to explore their opinions about artificial intelligence, digital marketing, and customer engagement. The majority of respondents agreed that:

- Using smart bank applications and a chatbot service that relies on artificial intelligence forecasting to make decisions.
- Using artificial intelligence in banking operations saves time and effort and meets needs.
- The bank takes into account the marketing of services digitally when dealing with it through marketing via its website to help customers.
- The bank seeks to provide all information about potential customers when marketing services digitally.
- The bank takes into account attractive advertising windows when dealing with marketing services digitally.

In light of this, the problem of the study is summarized in the following main question: To what extent is there a role for digital marketing in the relationship between artificial intelligence and customer engagement from the point of view of online banking clients?

The following sub- questions branch out from the main question:

- What is the nature of the relationship between artificial intelligence, digital marketing, and customer engagement from the point of view of online banking clients?
- To what extent do the artificial intelligence and its dimensions affect the improvement of digital marketing from the point of view of online banking clients?
- To what extent do the artificial intelligence and its dimensions affect customer engagement from the point of view of online banking clients?
- To what extent does digital marketing affect customer engagement from the point of view of online banking clients?

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- To what extent does digital marketing as a mediating variable influence the relationship between artificial intelligence and customer engagement from the point of view of online banking clients?
 - To what extent do personal variables (gender and educational level) affect the attitudes of the study sample regarding the study variables (artificial intelligence, digital marketing, and customer engagement)?

Research Objectives:

In light of the study problem, a set of objectives were formulated, which the study seeks to achieve: revealing the role for digital marketing in the relationship between artificial intelligence and customer engagement from the point of view of online banking clients.

The following sub- objectives branch out from the main objective:

- The contribution to knowledge in this paper will come from an investigation and an analysis of the problem and its application in the Egyptian context.
- Identifying the level of artificial intelligence, digital marketing, and customer Engagement from the point of view of online banking clients.
- Identifying the nature of the relationship between artificial intelligence, digital marketing, and customer engagement from the point of view of online Banking clients.
- Disclosing the impact of artificial intelligence and its dimensions on the improvement of digital marketing from the point of view of online banking clients.
- Disclosing the impact of artificial intelligence and its dimensions on customer engagement from the point of view of online banking clients.
- Disclosing the impact of digital marketing affects customer engagement from the point of view of online banking clients.
- Disclosing the impact of digital marketing as a mediating variable influences the relationship between artificial intelligence and customer engagement from the point of view of online banking clients.
- Determining the extent to which personal variables (gender and educational level) affect the attitudes of the study sample regarding the study variables (artificial intelligence, digital marketing, and customer engagement).

- Proposing a set of recommendations in light of the most important results reached, in an attempt to encourage the senior management of online banking to implement artificial intelligence practices to improve digital marketing and customer engagement.

Research Importance

The importance of this study is as follows:

A. Scientific Importance:

- Providing an intellectual framework for artificial intelligence applications and their importance, as well as identifying the concept of digital marketing and customer engagement.
- Shedding more light on the applications of artificial intelligence and improving customer engagement by the role of digital marketing, which helps open the way for researchers for further study.

B. Practical Importance:

- The results of this research would aid Egyptian bank managers in creating efficient advertising tactics to raise client awareness of online banking among Egyptian consumers.
- The importance of the study in relation to the subject itself and the applied field of study and its increasing effects at the present time on contemporary organizations, as the development of awareness of artificial intelligence applications has prompted thought and interest in improving the use of digital marketing and customer engagement for online banking clients.
- The study's contribution to the process of deepening senior management's vision of the role of the independent variable (artificial intelligence), the mediating variable (digital marketing), and the dependent variable (customer engagement).
- The study derives its practical importance from the importance of the field of application represented by the clients of the online banking.
- The results of this study contribute to raising awareness of bank officials in the application of the concept and dimensions of artificial intelligence and how the results revealed by the study can be benefited from in applying artificial intelligence and improving digital marketing and customer engagement to the clients of online banking.

Research Theoretical Background

A. Artificial Intelligence (AI)

1. Artificial Intelligence Definition:

Artificial Intelligence is an experimental branch of computer science whose mission is to seek to create intelligent devices that can perform complex and diverse tasks based on their intelligence (Yadav et al., 2017). (Alsedrah, 2017) also defines it as that field of study that depicts the skill of machine learning just like humans. And (Tuomi, 2018). added that artificial intelligence is a machine that understands and interprets sounds & languages, works to solve problems, diagnoses medical conditions, controls cars on the road, plays games like chess, and imitates impressionistic images of Van Gogh's paintings, and artificial intelligence is concerned with studying ideas that will form machines capable of simulating in accordance with traditional human responses, given the human ability to intend, think, and conclude (Soni et al., 2019). (Al-Astal, 2020) defined the modern science that is concerned with producing devices or software that mimic the human mind and are able to store and analyze data, experiences, and knowledge and employ them in decision-making or predicting new situations through their ability to learn. Procedurally, artificial intelligence is a part of computer science that aims to simulate a cognitive ability to replace humans in performing appropriate functions in a specific context that require intelligence.

B. Dimensions of Artificial Intelligence

1. Expert Systems:

Expert systems use methods to solve problems that are very similar to the methods used by a human Expert, and their structure consists of immediacy (Al-Sayyed et al., 2021). Knowledge base, working memory, inference engine, and interpretation facility: it is possible to develop an expert system program for any problem that involves choosing from a specific set of options, the decision being based on logical steps. Hence, any domain in which a person or group has special expertise that others need is a potential domain for an expert system (chukwudi, 2018). (Al-Rosan& Farsakh, 2019) believed that expert systems are techniques that work to discover solutions to problems that require specialized knowledge and skill, and the system works in them using the expert's way of thinking, skills, and motivations in order to emulate them.

2. Artificial Neural Networks:

The forces that made artificial neural networks more widely applicable today in today's increasing computing power, data availability and so-called cloud computing, these elements together have doubled their applicability. ANNs are inspired by the nervous system of the human brain and their main advantages compared to established techniques (Ahmed et al., 2018). The idea of artificial neural networks is to simulate data to reach a model of this data for the purpose of analysis, classification, prediction, or any other processing without the need for a proposed model for this data. Hence, artificial neural networks have gained the attention of many researchers and scientists, as they have high flexibility in comparison. With other methods used in the process of learning a data model, storing information and broadcasting it in an Artificial Neural network.

According to (Ahmed et al., 2018) ANNs have great potential to generate additional value compared to fields that use other IT tools such as regression, estimation, and clustering. They also estimate that in 69% of their use cases, ANNs provide training improvements to techniques already in use. While in 16% of cases Neural Networks provide results that no other analytical technique can provide.

3. Smart Agents:

An intelligent agent system is based on the presence of sensors that feed the system with information from the outside world, which then decides whether it should act according to the situation or not. Intelligent agents have the following characteristics (Stoffels, 2019):

- Independence: Here we mean that the designed program is independent of the user so that it performs the tasks assigned to it without motivation or assistance from the user.
- Communication prowess: An intelligent agent must be able to communicate with the environment, the user, and other agents in the environment so that it can best perform its task.
- Ability to participate: The agent is designed to be able to perform a group task with other agents to ensure the performance of a greater and more impactful work.
- The ability to reach a solution: This means that the agent is able to deduce and analyze to reach the best solution.

4. Genetic Algorithms:

Genetic algorithms are some of the most important programs that rely on the concept of evolution. If the species and races in natural systems are subject to the surrounding environment and interact with it, producing new varieties that are more suitable for the environment through evolutionary processes, then the algorithms work correspondingly to individuals in the environment, and based on the concept of evolution, the algorithms work. Genetics are used as programs or software packages in a way that allows possible solutions to financial or banking problems, for example, to compete with each other, and in the context of the evolutionary struggle for solutions, survival is for the best or the fittest. Today, this technology is generally used in financial banking activity and, in particular, in providing solutions. And supporting investment decisions (Hussain, 2018).

C. Digital Marketing (DM)

1. Digital Marketing Definition:

The marketer communicates with her current and potential customers via her website, smartphones, email, or social media (Ben Jarwa, 2014), indicated that digital marketing is an activity that uses computers, information, and communication technology, most notably the Internet, in order to market goods and services (Al-Ajjal& Karima, 2015), noted activities and actions facilitated by digital technology to create connection and deliver value to customers and other partners (Kannan, 2017), added that digital marketing is the promotion of products and services through digital channels to reach the final consumer at the right time and place and through the right channels (Rao et al, 2016), indicated the use of electronic tools such as websites, interactive social media, phone applications, advertisements, online videos, and email to engage Customers (Kotler& Armstrong, 2017), an umbrella term that describes the process of using Digital technologies to acquire customers, build customer preferences, promote and improve brand awareness, lower costs and increase retention (Kannan, 2017), defined digital marketing as an umbrella term for Marketing products or services that use digital technologies, primarily on the Internet, but also including mobile phones, display ads, and any other digital medium (Talikoti, 2019), the use of digital technologies to assist in marketing activities in order to improve Customer knowledge by matching their needs in the developed world (Sundaram et al., 2020).

2. Digital Marketing Pillars:

(Lin, 2011; Al-Ajjal& Karima, 2015) agreed on the following pillars of digital marketing:

- Search engine optimization (SEO): placing the website in the first search lists with organic search results.
- Content Marketing: By delivering information in a way that is beneficial to both parties by presenting an article or presentations targeting a specific group.
- Digital advertising: via Digital Marketing platforms and search engines to promote and advertise elements of the Marketing mix.
- E-mail: to exchange messages Digitally through the Internet.
- Making websites easy to use: designing websites or electronic pages that enable easy access and benefit from them.
- Distinctive Marketing performance: by achieving goals and making optimal use of available financial and human resources. Opening new markets: by breaking time and space barriers and attracting new Customers.
- Reducing costs: because there is no need for investment infrastructure and reducing logistical obstacles.
- Improving the service: designing and delivering the service correctly from the first time and in a better way the following times, while achieving diversified Customer satisfaction and enjoying competitive advantages in quality, speed of delivery, and improving added value.
- Services provided: that achieve satisfaction and satisfaction among Customers and create loyalty and belonging among them.
- Strengthening the relationship with Customers: by adopting policies that will get closer to Customers using effective and integrated communication channels.

3. Digital Marketing Tools

3.1. Mobile Marketing:

It means all activities related to communication with the Customer through the use of the telephone with the aim of promoting sales of products and providing information (Vinerean et al., 2013), it is one of the most important electronic Marketing methods due to the wide spread of its use, the possibility of contacting large numbers of Customers and targeting the desired Customer (Kordi et al., 2014).

3.2. Social Media sites:

The involvement of Customers in the process of creating value via the Internet and sharing ideas among themselves (Vinerean et al., 2013), point out a set of dimensions that are required to establish contacts with Customers and increase traffic on enterprise websites, which are: Online communities around the product and interaction through a Facebook or Twitter page, content sharing, access to social networking sites, credibility, emotional communication and generating trust and loyalty (Khan & Jan, 2015), allows owners of advanced products to find on these sites an opportunity to communicate with current and potential Customers that was not available before and provides the customer with sufficient credibility to deal (Muhammad, 2023).

3.3. E-mail Marketing:

It is direct communication through non-personal messages with carefully selected and targeted individuals for the purpose of obtaining an immediate response and fruitful and lasting relationships with the customer, and it takes place from one person to another or from one party to another to achieve interaction between them and the targeted Customer using e-mail (Al-Taie& Al-Abadi, 2010).

3.4. Website:

It means personal communications with every potential current customer at a modest cost, through which the company adopts a direct and appropriate Marketing policy that meets the marketing needs and gives additional value to the Customer (Kordi et al., 2014), The website is linked to creating more links to its pages and including important words and phrases that the customer usually uses, which is He searches for information in the relevant field, and the goal remains to attract potential customers to the website (Muhammad, 2023).

Good website design according to Kotler is linked to the following elements: context (presentation, appearance, and design), content (text, images, and videos), community (communication), Tailoring (customer customization, communication (with the user and vice versa), relevance (relationships with other sites), Commerce (online selling, updating) and constant change.

3.5. Online Advertising:

(Francois et al., 2012) believed that advertising is done through search engines by purchasing keywords that help in displaying the advertisement when searching in the browser for a related word, and determining the location of the advertisement depends on two elements that search engines take into consideration (price and quality). They are graphic advertisements with a standard space that appear next to the content on electronic pages, instant messenger applications, email, etc., and can include texts, symbols, or images.

They represent the key elements of visual advertisements over the Internet and have the advantages of low costs for live broadcasting, real-time updating, high wealth, personalization, targeting, and centralization using wireless technology and GPS technology (Kordi et al., 2014).

4. Dimensions of Digital Marketing

(Parsons et al., 2017; Chan & Guillet, 2011) agreed about the dimensions of Digital Marketing as follows:

4.1. Attraction:

(Francois et al., 2012) believed that the marketer must intervene at all levels of the value chain through. Marketers can attract customers through advertisements on websites and advertising windows or related links. Relevance. other companies may resort to using methods of attraction through the company's association with a group of charitable works, loyalty programs for customers, or the production of environmentally friendly products for the purpose of attraction (Jalango, 2015).

4.2. Engage:

Is the involvement of users in sharing, paying attention, achieving interaction, or completing procedures or business, generating interest and absorption, includes creative programming of interactive content, using the resulting content and practical capabilities, and in the absorption stage, many digital marketing applications collapse in a short period, being uninspiring, having poor content, or poor presentation, while other applications may be very advanced or have high-visibility graphics and impact, making the customer more attentive and interactive?

(Kian et al., 2010) believed that some companies may resort to creating real interaction between customers who are similar in the services required or by creating a virtual community of interest to deliver useful information to both parties in order to increase the customer base and sales.

4.3. Retain:

(Chan& Guillet, 2011; Pawar& Amruta, 2014) agreed that retention is a means of providing the largest amount of advertising messages in cyberspace by providing information or holding competitions to persuade the customer at the lowest cost, the interest on the part of companies is to develop the relationship and communicate with them on an ongoing basis, which requires engaging with customers, understanding their needs, and believing that the customer will not return again without a reason (Ali et al., 2019).

4.4. Learn:

It includes identifying preferences, points, information, continuous preference, and learning. As for behavioral information, it can be extracted from customer records in electronic files or click records. with the mouse via the computer, the majority of companies support the chat system to solicit interactions and discussions for the purpose of knowing customers' purchasing preferences (Chan& Guillet, 2011).

4.5. Communication Relate:

(Chan& Guillet, 2011) point out that most companies seek to publish their activities on social media and blogs, especially what customers are searching for, to make them reveal their experiences as a result of using the services, or by publishing a bulletin about the company's activities to communicate with its customers, (Ghiselli, 2015) believed that communication is one of the most important value creation opportunities in digital marketing, as it is the most effective in allocating the interaction between the service provided, time, and marketing effort to more than one customer at the same time.

D. Customer Engagement (CE)

1. Customer Engagement Definition:

As an emotional relationship between the company and its customers, based on involvement and participation opinions shared by the customers (Vivek, 2009), enclosed the role of commitment, communication, and collaboration in the creation of engaged customers and stated that engagement

and loyalty are distinctly different (but related) concepts (Bowden, 2009). Moreover (Gambetti& Graffigna, 2010) proposed the concept of Engagement as getting the benefits from consumer's experiences in customer-centric marketing approaches based on exploratory and systematic content analysis. They reported that Engagement has five dimensions (customer, consumer, advertising, brand, and media), as a psychological condition resulting from past experiences that are based on the past interactive relationship and involvement in the company's activities (Brodie et al., 2011), the company can achieve a successful customer engagement through building emotional ties in dealing with their Customers and stated that customer Engagement refers to conducting experiences that help companies to create stronger and sustainable long-term relations between the company and its customers (Sashi, 2012), (Beckers et al., 2014) classified the customer Engagement levels introduced within the scope of literature into three classifications. The first is customer-to-customer connection regarding the company or its brand, the second is involved customers in a co-creation collaboration activity regarding the development required for launching a new product, and finally, listening to customers' feedback, which represents their actual needs.

2. Dimensions of Customer Engagement:

(Brodie et al., 2013; Hollebeek, 2012) agreed on three main dimensions of customer engagement:

- The cognitive dimension means that the client becomes always active, attentive, and immersed, and practices the sustained cognitive processing through an exchange of knowledge and experience with clients.
- The Emotional dimension: It represents the ability to enjoy oneself, passion, and enthusiasm.
- The Behavioral dimension: It represents the client's behavior in participating enthusiastically and actively presenting the support.

E. Online Banking:

Egypt is a major player in the Middle East economy and has made considerable efforts in undertaking entrepreneurial activities to enhance its economic development (Hilal& Tantawy, 2022). The Egyptian banking sector is known in MENA and North Africa as the banking powerhouse (Mostafa, 2020).

Frequently used in scholarly literature, which are mutually interchangeable, include online banking, virtual banking, home banking, and remote electronic banking (Bhai, 2018; Madushani & Balendran, 2020; Khan, 2021).

Online banking refers to the execution of financial services using mobile communication techniques together with mobile devices³.

Online banking that allows people to interact with their banking accounts via the Internet from virtually anywhere in the world provides enormous benefits to consumers in terms of the ease and cost of transactions. This system permits consumers to request information and carry out most banking services, such as opening accounts, making deposits, writing checks, paying bills, transferring funds, inquiring about account balances and savings, paying mortgages, purchasing online products via the internet, as well as certificates of deposits (Cleens et al., 2002; Alnaas, 2021; Mswahili, 2021).

Online banking is defined as an electronic payment system that clients can use to conduct their online financial transactions through a financial institution's website, enjoying a number of conveniences, including the opportunity to save time (Nethanathan & Shanmugathas, 2018; Alnaas, 2021). Additionally, reduce overhead costs, personnel costs, transaction costs, and operational costs, providing them with better services at reduced costs, convenience, and quicker response (Madushani & Balendran, 2020).

Thereby, clients can conduct their banking transactions electronically by using any technological device, such as a personal computer, laptop, tablet, or mobile device that enables them to access the internet without any need to visit a bank (Lin et al., 2020; Mswahili, 2021).

literature Review:

A. Previous studies related to Artificial Intelligence:

(Khawalid, 2019) came to understand the nature of artificial intelligence by creating computer programs capable of simulating intelligent human behavior, to provide the computer with these programs that enable it to solve a problem or make a decision in a situation based on a description of the problem or issue for this situation. He also talked about the basic

³ International telecommunication Union, 2011

applications of artificial intelligence, which are neural networks, expert systems, intelligent agents, and genetic algorithms. The article discussed the advantages of using artificial intelligence systems in banks, including supporting the bank's operational operations, as it is considered the main operator of the bank's various operations and daily transactions.

(Rainer, 2020) analyzed artificial intelligence as systems based on hybrid devices between humans and machines, and with the possibility of humans becoming a functional part of that machine, and the media role of humans will be limited to creative works only that require emotional and social capabilities. Therefore, artificial intelligence systems will prevail by following a strategy of power; it is known as algorithmic discrimination or mechanical inequality. The study also focused on the concept of feedback in application to the electronic artificial intelligence systems used on Facebook, which explore the user's reactions, knowledge, and desires and thus work to subject users to the control mechanism. The study concluded that the widespread use of artificial intelligence systems will be affected by several factors. The most important of which are the social and economic conditions of society, its digital habits, and the position of the political system towards those systems.

(Al-Sayyed et al., 2021) Studied the factors affecting employees' intention to adopt artificial intelligence in the Egyptian telecommunications sector. The descriptive approach was relied upon. And it was distributed (384) questionnaires, and the data were analyzed based on statistical programs (SPSS & PAMOS) through a specific set of statistical tests. The results of the research were the acceptance of the four hypotheses of the research, which are that the expected performance has a statistically significant positive effect (0.542) on the intention of employees to adopt Intelligence. Artificial effort has a statistically significant positive effect (0.525) on employees' intention to adopt artificial intelligence.

B. Previous studies related to Digital Marketing:

(Ng'ang, 2015) aimed to determine the effectiveness of digital marketing strategies on the performance of commercial banks in Kenya, as the study population consisted of all commercial banks operating in Kenya, which number (42) resorts, and the study sample consisted of (385) individuals, and the results showed that digital marketing strategies, which

include marketing via mobile phone applications, marketing via social media, website design and development, online advertising, and email marketing, improved the performance of commercial banks in Kenya through increased revenues, decreased costs, and increased market share.

(Mutoni, 2018) titled the impact of digital marketing on the performance of Commercial Banks in Rwanda, The Case of some selected commercial banks in Rwanda, where a field study was conducted on two commercial banks (Beirut Commercial Bank is a Kuwaiti bank), and the study sample consisted of (355) clients and (243) employees, and the results indicated a significant impact of the dimensions of Digital Marketing (website development, email marketing, digital advertising, smartphone applications, and marketing via social media platforms) on the performance of commercial banks in Rwanda through increasing profitability and increasing market share.

(Mohamed, 2020) described the role of digital marketing in influencing the perceived value of Egyptian Airlines customers and the extent to which opinions differ in preference for digital marketing tools and the perceived value depending on the carrier company and the identity of the customer, the researcher used the descriptive analytical method and a sample consisting of 384 items; data was collected and analyzed using the SPSS program. The study reached a number of results, the most important of which is that there is a correlation between the main dimensions of digital marketing and the perceived value of customers. There is an effect of the main dimensions of digital marketing on the perceived value of customers.

(Attia, 2022) identified the impact of digital tourism marketing on the behavior of Algerian tourists to test their tourist destination, where the descriptive and analytical approach was followed, while the study sample consisted of (264) items, where the questionnaire tool was adopted to collect and analyze data using the SPSS program, and it was concluded that there is a statistically significant impact for each of the elements of the digital marketing mix, digital service, digital pricing, and digital promotion, on the behaviors of Algerian tourists, as for the digital distribution element.

(Muhammad et al., 2023) identified the role of digital marketing in making a purchase decision in the real estate sector, an applied study on real

estate companies in Greater Cairo. This study relied on the descriptive analytical approach for a simple random sample consisting of 360 individual clients of real estate companies in Greater Cairo, and the survey tool was used as a means of collecting data. The study reached several results, the most important of which is that there is a positive impact of digital marketing in its dimensions on making a purchase decision.

C. Previous studies related to Customer Engagement:

(So et al., 2014) studied the role of customer engagement in building consumer loyalty to tourism brands and tested the linkages of customer engagement with traditional antecedents of brand loyalty. Results based on (496) hotel and airline customers suggest that customer engagement enhances customers' service brand evaluation, brand trust, and brand loyalty. The results show that service brand loyalty can be strengthened not only through the service consumption experience but also through customer engagement beyond the service encounter. This study contributes to the literature by providing an empirical evaluation of the relationships between customer engagement and key brand loyalty development factors.

(Mohamed& Dkrory, 2015) Interested in the relationship between the introductions and dimensions of customer engagement by applying it to customers of mobile phone service companies in Egypt. The study aimed to identify the introductions of Customer Engagement, determine the nature of the relationship between the introductions and dimensions of customer engagement, and the introductions of customer engagement were (communication, interaction, satisfaction, retention, commitment, and endorsement) were the dimensions of Customer Engagement (cognitive, emotional, and behavioral), and the researcher used the statistical analysis as a tool to collect data. Among the most important findings of the study: there are no significant differences between the opinions of customers of mobile phone service companies about the availability of the customer engagement introductions clauses; there is no significant relationship between the introductions and dimensions of customer engagement according to the opinions of corporate clients; there is no significant difference in the relative importance of the impact of the introductions of the client's engagement on the various dimensions of attachment (cognitive, emotional, and behavioral).

(Kim et al., 2018) titled "Does customer engagement in corporate social responsibility initiatives lead to customer citizenship behavior?" the mediating roles of customer company identification and affective

commitment". This study examined how customers' perceptions of corporate social responsibility affect their customer citizenship behavior and the mediated link through customer company identification and affective commitment. Working with a sample of (615) banking service customers in South Korea, structural equation modeling is employed to test the research hypotheses. The results of this study suggest that customers' perceptions of CSR are positively related to their customer citizenship behavior. Second, customer company identification was found to mediate the positive relationship between customers' perceptions of CSR and customer citizenship behavior. third, customers' affective commitment towards their organization also mediated the positive relationship between customers' perceptions of CSR and customer citizenship behavior.

(Hao, 2020) tried to explain the landscape of customer engagement in hospitality and tourism. This research aims to deliver a systematic review of customer engagement in hospitality and tourism by synthesizing existing literature, thus presenting a state-of-the-art landscape of customer engagement research. A total of 173 peer-reviewed articles were collected from seven databases, spanning from 2007 to 2020. A systematic review was conducted by analyzing, categorizing, and synthesizing existing studies to examine the evolution, conceptual nature, typology, and measurement of the existing literature on customer engagement in hospitality and tourism. This study aims to provide an overview of the temporal, spatial, sectoral, and journal-wise distribution of customer engagement in hospitality and tourism.

(Naqvi et al., 2021) discussed generating customer engagement in electronic brand communities. The purpose of the research is to investigate the factors in customer engagement with electronic brand (e-brand) communities and the mechanism behind their effects. The aim is to investigate the influence of various characteristics of e-brand communities on customer engagement, satisfaction through brand loyalty, and recommendations. A survey questionnaire was administered to (320) Facebook users in Pakistan. The aim is to investigate the influence of various characteristics of e-brand communities on customer engagement and satisfaction through brand loyalty and recommendation. The findings indicate that each community attribute significantly affected customer engagement, which was further found to mediate the relationship from these attributes through to customer satisfaction and then to brand loyalty and recommendation.

D. Previous studies including study variables:

(Brodie & Hollebeek, 2013) conducted to test customer value, customer engagement, and customer-based brand equity in the context of a digital payment app; the objective of the research is to explore the relationship among perceived quality value, hedonic value, social value, price value, customer engagement, and customer-based brand equity using stimulus organism response (S-O-R). customer engagement and customer-perceived value theories for digital payment apps. In addition, the study examines the mediating role of customer engagement between customer value dimensions and customer-based brand equity and analyzes the moderating role of age. Partial least squares-based structural equation modeling was used to test the proposed hypotheses through a sample of 316 respondents who used digital payment apps. The findings indicate that customer engagement mediates the relationship between customer value dimensions and customer-based brand equity. Age does not moderate the relationship between customer value dimensions and customer engagement. The study confirmed the pronounced effect of specific paths for various age groups.

(Reddy, 2017) aimed to analyze the impact of digital marketing on the consumer purchasing decision-making process in the retail sales process to customers of Nike in South Africa. The study relied on the exploratory factor analytical approach, and the study sample consisted of 275 employees. The results of this study indicate that the consumer has adopted digital marketing, and this has affected his behavior. As a result, retail institutions had to integrate digital marketing into their marketing strategies. It has also been proven that digital marketing has an impact on the consumer's purchasing decision-making process, and the impact was greater on the stage of identifying the problem, the purchase decision, and post-purchase behavior.

(Bouzrab, 2019) aimed to analyze the reality of applying artificial intelligence in the Indian banking sector, and to achieve the objectives of the study, the inductive approach was relied upon by extrapolating and analyzing studies, research, books, and periodicals that are related to the field of study. The study sample consisted of 325 items. The results showed that applying artificial intelligence repeatedly in the banking sector has many positives, including increasing worker satisfaction, gaining their loyalty, and reducing costs. The application of artificial intelligence also contributes to reducing the negative aspects accompanying banking work, such as cases of fraud, money laundering, and the disappearance of human errors. The results also showed

that there are a number of determinants that prevent the application of artificial intelligence, the most important of which is unemployment. In light of the results.

(Amina et al., 2021) conducted to test the impact of brand personality on customer engagement: a case study of L'Oreal in the Algerian market, and to show the most important measures that women focus on. This study is based on the random sample method, where (95) samples were distributed to women. This study found that there is a high degree of correlation between brand personality and women's engagement in the cosmetic market, but in a random frame. The brand's sincerity's role is very important in the cosmetic market marketing strategy.

(Salam, 2021) identified the nature of the relationship between digital marketing and gaining customer satisfaction by applying it to a sample of customers of the Egyptian General Company for Tourism and Hotels (EGOTH). The research used the descriptive analytical method, and it was distributed (384) questionnaires were analyzed using SPSS, and the study concluded that there is a statistically significant effect of the dimensions of digital marketing (retention, learning, and communication) in gaining customer satisfaction and also that there is a statistically significant relationship of the dimensions of digital marketing (retention, learning, and communication) in gaining customer satisfaction.

(Hajjaj, 2021) described the impact of using artificial intelligence methods on the development of digital marketing by removing electronic marketing, and the study sample consisted of 350 who work in companies (Juhaina, Almarai, and Lamar) and were analyzed using the SPSS program. One of the most prominent results of the study was that artificial intelligence methods achieve the most important principles of digital marketing quality through (after-sales service), as artificial intelligence methods provide response characteristics and automated tools that allow communication at any time and from any place, which achieves interactivity. artificial intelligence also provides an advantage to e-mail, which confirms the importance of its use in digital marketing, as it provides the advantage of automatic response, notifications, and concerns.

(El Borsaly& Mahni, 2022) investigated the effect of customer engagement in the relationship between brand commitment and customer

retention. The goal of this research is to determine the role of social media involvement as a moderating variable in the link between brand commitment and customer retention for smartphone businesses. The study is conclusive descriptive research and employs a deductive technique. The study utilizes the regulatory engagement theory to investigate the proposed research model in the Egyptian smartphone industry context. The study targeted a sample of 317 undergraduate students from the faculty of business at Ain Shams University. A structural equation model (SEM) was used to test the conceptual framework in this research. The study focused on the effectiveness and continuance of brand commitments as two key positive paths to customer retention. The results indicate that customer engagement positively influences the relationship between brand commitment and customer retention.

(Purwanto, 2022) tested and proved the impact of digital marketing strategy on purchasing decisions through the mediating role of brand awareness. The study relied on the descriptive approach, and to achieve the objectives of the study, a questionnaire was designed to collect data from a sample of 320 Indonesian small and medium-sized business customers. The results of the study showed that digital marketing has a positive and significant impact on purchase decisions and brand image as an intermediary variable. It can also enhance or increase the impact of digital marketing variables on purchase decision variables.

(Abdel Halim, 2023) aimed to focus on the role of the modern digital environment, specifically artificial intelligence, and its impact on raising the level of digital marketing performance, a survey approach was relied upon, and the study was applied to a random sample of (400) individuals, representing public relations practitioners in governmental or private institutions from the governorates of Cairo and Giza, and those interacting with the advertising and marketing campaigns of these institutions in which they work. The results show that there is a statistically significant effect between the level of public relations practitioners' information about artificial intelligence and the positive evaluation of its role in digital marketing.

(Mohammed, 2023) highlighted the importance of digital marketing in activating and developing the relationship with the customer by highlighting various digital marketing activities. The study was conducted on a sample of

350 customers of the Algeria Telecom Mobiles mobile phone company and used the statistical analysis program SPSS V.20. The results of the study indicated that the use of digital media in marketing activities contributes to activating and developing the relationship with customers, and that digital media contributes most to this. They are the media most used by the customer.

E. Commenting on literature Review:

In light of the previous studies related to the study variables, the researcher reached the following conclusions:

- Previous studies such as (Khawalid, 2019; Bouzrab, 2019) aimed to understand the nature of Artificial Intelligence by creating computer programs capable of simulating intelligent human behavior to analyze the reality of applying Artificial Intelligence in the Indian Banking sector.
- As confirmed by previous studies such as (Khawalid, 2019; Bouzrab, 2019; al-sayyed et al., 2021) It is of great importance in many fields and has clear impacts on our daily lives, improving the performance of various tasks and operations in general, and artificial intelligence provides new opportunities for innovation and development in various fields, as it enables the analysis of huge amounts of information, identifying patterns and arriving at innovative and effective solutions.
- The researcher also reviewed many previous studies, such as (Hajjaj, 2021; Al-Asdoudi& Nabil, 2023; Abd alhalim, 2023), in which the objectives and results were emphasized and which focused on the importance of the practices of the variables (artificial intelligence, digital marketing and customer engagement).
- Most previous studies, such as (Khawalid, 2019; Bozrab, 2019; Gultom et al., 2021; Moulay et al., 2021; Al-Omari, 2021) agreed on the dimensions (neural networks, expert systems, intelligent agents, and genetic algorithms), the current study also used these same dimensions.
- The current study agreed with previous studies such as (Andrew et al., 2020; al-sayyed et al., 2021), It follows the descriptive analytical approach and is similar in its analysis of data by relying on the statistical program SPSS.

- The current study differs from previous studies in the time period in which the study was applied and in the sample to which the study was applied: online banking clients.
- There is a dearth of academic research related to artificial intelligence, digital marketing, and customer engagement locally and in the Arab world.
- Transforming customer engagement with artificial intelligence: the mediating role of digital marketing.
- The current research is a valuable introduction to the next series of research that deals with customer engagement, artificial intelligence, and digital marketing.
- The current study agreed with most previous studies in adopting the descriptive analytical approach and the questionnaire as a tool for data collection.
- The current study identifies the role that digital marketing plays in the relationship between artificial intelligence and customer engagement.
- The time period in which the study was applied, and in the sample to which the study was applied, was a sample of online banking clients.
- Previous studies were applied to the independent variable: Artificial Intelligence, and in the field of application, for example, universities and companies.

Research Gap:

- lack studies in a way general that I had the role of digital marketing plays in the relationship between Artificial Intelligence and customer engagement.
- different from most studies Previous from where the goal and a field application were not there is a study of Egyptian I focused on the online banking clients.

Hypotheses Development:

(Khawalid, 2019; Bouzrab, 2019; Bouzrab, 2019; Moulay et al., 2021; Gultom et al., 2021; Al-Omari, 2021) agreed on the dimensions of Artificial Intelligence, which are (neural networks, expert systems, smart agents, and genetic algorithms). Accordingly, the researcher formulated the following hypotheses:

- (H₁) There is a positive correlation with statistical significance between artificial intelligence, digital marketing, and customer engagement from the point of view of online banking clients.
- (H₂) There is a statistically significant positive impact for artificial intelligence and its dimensions (neural networks, expert systems, smart agents, and genetic algorithms) on digital marketing from the point of view of online banking clients.
- (H₃) There is a statistically significant positive impact for artificial intelligence and its dimensions (neural networks, expert systems, smart agents, and genetic algorithms) on customer engagement from the point of view of online banking clients.
- (H₄) There is a statistically significant positive impact for digital marketing on customer engagement from the point of view of online banking clients.
- (H₅) There is a statistically significant positive impact for digital marketing on the relationship between artificial intelligence and customer engagement from the point of view of online banking clients.
- (H₆) There are statistically significant differences according to the opinions of online banking clients about study variables (artificial intelligence, digital marketing, and customer engagement) depending on their personal variables (gender and educational level).

The following figure illustrates the suggested study structure:

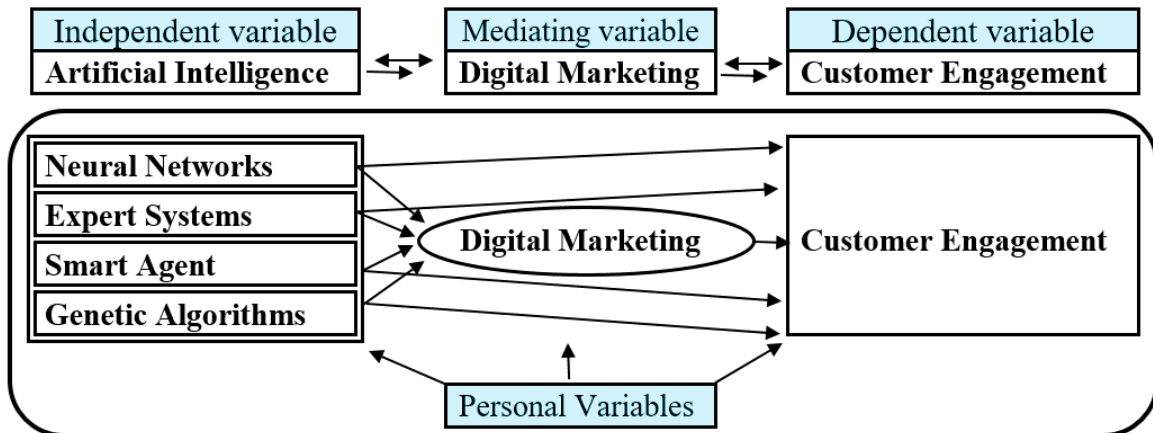


Figure 1: suggested study structure

Research Methodology

A. Research Approach:

This research depends upon the descriptive analytical approach, which starts with generalists, after admitting its soundness, and ends up with particulars using logical analysis to predict some findings of the hypotheses under study.

B. Techniques of Data Collection

1. Office Technique:

This method collects secondary data from sources such as books, reports, periodicals, and previous studies that are related to research variables. (artificial intelligence, digital marketing, and customer engagement) in order to construct the study's theoretical framework.

2. Field Technique:

This technique aims to collect primary data by using a questionnaire designed specifically for the current study. This questionnaire will be distributed to a random sample of online banking clients.

C. Research Variables Coding and questionnaire items:

Table (1) indicates the coding of research variables and their corresponding questionnaire items as follows:

Table 1: Research Variables Coding and its related items

Research Variables	Codes	Questionnaire Questions
Independent Variables:		
(Artificial Intelligence)	X	1→ 20
– Neural Networks	X ₁	1→ 5
– Expert Systems	X ₂	6→ 10
– Smart Agents	X ₃	11→ 15
– Genetic Algorithms	X ₄	16→ 20
Mediating Variable:		
(Digital Marketing)	M	21→ 34
Dependent Variable:		
(Customer Engagement)	Y	35→ 44

D. Questionnaire Design:

The questionnaire was designed to be used for collecting primary data for the study. The measurement items for this study were developed by adapting measures from previous studies and modifying them to fit the Egyptian environment. A pilot study was conducted in two ways to ensure that the items included in the questionnaire were relevant and easily understood.

Firstly, the initial copy of the questionnaire was directed to a number of professors and associate professors, and they reshaped some items to make them more understandable to potential respondents, Secondly. the questionnaire was pilot tested among some clients of online banking (40 individuals). They were instructed to answer the questions and then carefully review all items from a critical standpoint in order to identify problems such as ambiguity or redundancy. The researcher developed 44 items to measure the constructs of this study; 20 items were used to measure artificial intelligence, concerning the digital marketing 14 items were utilized to measure this mediating variable. with respect to customer engagement 10 items were used to measure this dependent variable. The researcher used a Likert scale ranging from 1 to 5 to measure the respondent's opinions in which 1= "Totally disagree" and 5= "Totally agree".

E. Research Population and Sample Selection:

The Egyptian Banking sector involves 38 operating banks and more than 2800 branches across Egypt⁴. This was following the approval of the board of directors of the central bank of Egypt to merge First Abu Dhabi Bank with Bank Audi Egypt in 2022⁵. Overall, commercial bank branches increased annually over the observed period⁶. These banks include 5 public banks and 33 private commercial banks. Internet Banking is available at 32 out of 38 Egyptian banks (75%), serving 1.4 million clients and 128 million transactions each year (Nasr & Helmy, 2018). On the other hand, the population of the study is represented by the Online Banking clients, but this number is constantly changing and more than (100,000) individuals.

A simple random sample of 20 banks has been chosen. Due to the lack of a population frame and the list of population elements that are necessary for drawing probability samples (Sekaran & Bougie, 2016), a random sample was drawn. It consisted of 384 individual online banking clients, which is one of the types of probability samples in order to select the clients of the online banking.

F. Research Variables and Measurement:

- Independent Variable (Artificial Intelligence): In measuring this variable, the researcher relied on a study of (Khawalid, 2019; Bouzerb, 2019; Gultom et al., 2021; Moulay, et al., 2021). The scale consists of (20) statements divided into four dimensions (neural networks, expert systems, intelligent agents, genetic algorithms).
- Dependent Variable (Customer Engagement): In measuring customer engagement, the researcher will rely on a study (Dkrory ,2015). The scale consists of (10) statements.
- Mediating Variable (Digital Marketing): In measuring Digital Marketing, the researcher will rely on a study (Al-Shammari, 2017). It includes (14) statements, which have been used by many researchers, such as (Mohamed et al., 2023).

⁴ CBE. (2019). Annual report 2018-2019. The Central Bank of Egypt

⁵ <https://www.statista.com/statistics/1375306/number-registered-banks-south-africa/#statisticContainer>

⁶ <https://www.statista.com/statistics/1375938/number-of-commercial-bank-branches-in-egypt/#statisticContainer>

The questionnaire was designed in English and translated into Arabic. The survey was administered between August 2024 and November 2024, when 384 respondents from Kafr El-Sheikh, Tanta, and Alexandria were randomly chosen for the survey. 384 valid questionnaires were returned. Questionnaire forms were distributed in both languages and collected electronically.

G. Tools of Statistical Analysis:

The following are the statistical techniques that is used for analyzing research data:

- The Alpha Cronbach test examines the degree of internal consistency among the items that comprise each variable.
- Descriptive analysis methods (arithmetic mean and the standard deviation).
- Pearson Linear Correlation Coefficient method to determine the strength and direction of the relationship between the variables according to the opinions of online banking clients.
- Simple and Multiple Linear Regression method to test the effect of Artificial Intelligence and its dimensions on digital marketing, the effect of Artificial Intelligence and its dimensions on customer engagement, and test the effect of Digital Marketing on customer engagement from the point of view of Online Banking clients.
- Structural equation modeling (SEM) to determine the effect of digital marketing on the relationship between artificial intelligence and customer engagement from the point of view of online banking clients.
- T-test for two independent samples and one-way ANOVA to determine the differences according to the opinions of online banking clients about study variables depending on their personal variables (gender and educational level).

Research Statistical Results and Hypotheses Testing

A. The response rate to the survey:

The researcher distributed the survey forms to the online banking clients, and the number of collected forms reached 384 from 384.

B. Assessing the reliability and validity of the study measures:

1. Reliability Test:

Cronbach's alpha measure indicates the degree of internal consistency for the questionnaire. The values of Cronbach's alpha range from 0 to 1; if Cronbach's alpha equals 0.6 or more, it indicates good reliability of the questions of the questionnaire.

Table 2: Reliability Analysis (Cronbach's Alpha Coefficients)

Research Variables	No. of items	Cronbach's alpha
Artificial Neural Networks	5	0.797
Expert Systems	5	0.818
Intelligences Agents	5	0.854
Genetic Algorithms	5	0.753
Digital Marketing	14	0.939
Customer Engagement	10	0.875

Source: Results of the statistical analysis

From the previous table (2), we find that all sub-variables have a corrected item-total correlation greater than 0.30. We also find that the reliability coefficients for the dimensions in the scale have reached, in order, (0.797, 0.818, 0.854, 0.753), which are high reliability coefficients, and therefore we find that this scale has a high degree of reliability. We also find that the reliability coefficient for the measurement of digital marketing has reached (0.939), while the reliability coefficient for the measurement of customer engagement has reached (0.875), and therefore we find that this scale has a high degree of reliability.

– Measuring the validity of the survey:

The validity of the scale can be measured in several types, content validity and construct validity, as shown in the following:

– Content validity:

The researcher responded to the opinions of the arbitrators and made the necessary modifications until the questionnaire came out in its final form.

– **Construct validity:**

The construct validity of the dimensions was calculated by finding the square root of the reliability coefficient as follows:

Table 3: The results of the construct validity of the study measures

Dimension	Cronbach's alpha coefficient	Construct validity
Artificial Neural Networks	0.797	0.893
Expert Systems	0.818	0.904
Intelligences Agents	0.854	0.924
Genetic Algorithms	0.753	0.868
Digital Marketing	0.939	0.969
Customer Engagement	0.875	0.935

Source: Results of the statistical analysis

From Table (3) above, we find that all dimensions have a high degree of validity, and this confirms that the survey has a high degree of validity.

2. Discriminant Validity:

determines whether the items measuring one theoretical concept are distinct from those measuring another theoretical concept. Firstly, the Cronbach's alpha coefficient for each variable should be higher than the coefficients of correlation between that variable and other variables. Secondly, the square root of the average variance extracted (AVE) for the variable should also be greater than the coefficients of correlation between that variable and other variables. As shown in Table (4).

Table 4: The results of Discriminant Validity

Variables	Cronbach's alpha	AVE	Artificial Intelligence	Digital Marketing	Customer Engagement
Artificial Intelligence	0.912	0.915	1		
Digital Marketing	0.939	0.882	0.835	1	
Customer Engagement	0.875	0.830	0.781	0.817	1

3. The Model fit:

The measures of the research (artificial intelligence, digital marketing, and customer engagement) were validated by confirmatory factor analysis (CFA) using Amos V.21, which indicates the model's overall fit to the data and the items within a scale that measure a specific concept display a strong positive correlation.

Table 5: Indicators of CFA Test

Indicators of model fit	Obtained	Suggested
CMIN /DF	2.996	CMIN/DF ≤ 5
NFI (Normed of Fit Index)	0.998	NFI ≥ 0.9
IFI (Incremental Fit Index)	0.911	IFI ≥ 0.9
TLI (Tucker- Lewis Index)	0.958	TLI ≥ 0.9
CFI (Compare Fit Index)	0.919	CFI ≥ 0.9
RMSEA (Root Mean Square Error Approximation)	0.070	0.5 ≤ RMSEA ≤ 0.08

Source: Results of the statistical analysis

C. The characteristics of the study sample:

The researcher described the demographic characteristics of the study sample by finding frequencies and percentages as follows:

Table 6: Frequencies and percentages of the study sample distribution

Variables	Category	Frequency	percentage
Gender	Male	254	65.9%
	Female	130	34.1%
	Total	384	100%
Age	less than 30 years	88	22.7%
	From 30 years to less than 40 years	119	31.2%
	From 40 years and more	177	46.1%
	Total	384	100%
Qualification	Intermediate education	72	18.5%
	bachelor's degree	201	52.6%
	Postgraduate	111	28.9%
	Total	384	100%

Source: Results of the statistical analysis

D. The results of the descriptive analysis of the data

The descriptive analysis for the dimension of artificial neural networks is carried out as follows:

Table 7: The results of the descriptive analysis for the Research Variables

dimension	Arithmetic mean	Standard deviation	The significance
Artificial Neural Networks	4.3438	0.79326	high
Expert Systems	3.9656	0.96489	high
Intelligences Agents	4.3203	0.79191	high
Genetic Algorithms	4.0443	1.00263	high
Digital Marketing	4.2193	0.87441	high
Customer Engagement	4.1354	1.03586	high

Source: Results of the statistical analysis

E. Test the dependence of the study variables on the normal distribution:

In this study, data are tested for normality by using the Kolmogorov–Smirnov (K-S) test. according to the table (8), we find that the value of the asymptotic significance (Sig) for the variables (artificial intelligence, digital marketing, and customer engagement) is (0.215, 0.188, 0.202), which is values greater than the level of significance ($\alpha= 0.05$), and therefore we find that the data for these variables follow the normal distribution and in this case parametric tests can be applied:

Table 8: Kolmogorov–Smirnov (K-S) results for normality test

Variables	Calculated value	Asymptotic Significance (Sig)	The decision
Artificial Intelligence	1.055	0.215	Normal
Digital Marketing	1.087	0.188	Normal
Customer Engagement	1.070	0.202	Normal

Source: Results of the statistical analysis

F. Hypotheses Testing Results:

The hypotheses were tested in order to examine the following:

1. The First Hypothesis:

The first main hypothesis (H_1) investigates the correlation between artificial intelligence, digital marketing, and customer engagement from the point of view of online banking clients. The validity of this hypothesis is tested using Pearson's simple linear correlation method, as showed in Table (9):

Table 9: Results of the linear correlation analysis between Variables

Variables	Artificial Intelligence	Digital Marketing	Customer Engagement
Artificial Intelligence	1		
Digital Marketing	0.835**	1	
Customer Engagement	0.781**	0.817**	1

Source: Results of the statistical analysis

From the previous table (9) we find that:

- The linear correlation coefficient between artificial intelligence and digital marketing is (0.835), Artificial Intelligence and Customer Engagement is (0.781), digital marketing and Customer Engagement is (0.817), And for all these relationships, we notice a positive correlation with statistical significance.
- The value of the asymptotic significance is (Sig= 0.000) which is less than the level of significance ($\alpha= 0.05$) and therefore the null hypothesis is rejected and the alternative hypothesis is accepted that there is a statistically significant positive correlation between Artificial Intelligence, digital marketing and Customer Engagement from the point of view of online banking clients with a confidence level of 95%.
- We conclude that accepting the alternative hypothesis that "There is statistically significant positive correlation between artificial intelligence, digital marketing and Customer Engagement from the point of view of online Banking clients with a confidence level of 95%.

2. The second main hypothesis:

The second main hypothesis (H₂) investigates the impact of artificial intelligence and its dimensions (neural networks, expert systems, smart agents, and genetic algorithms) on digital marketing from the point of view of online banking clients. The validity of this hypothesis is tested using the simple linear regression method as follows:

Table 10: Results of the simple linear regression analysis for Artificial Intelligence on Digital Marketing

Variables	Regression Coefficient	Standard Error	Calculated Value (T)	Asymptotic Significance (Sig)	Decision
Constant	1.293	0.097	13.324	0.000	Significant
Artificial Intelligence	0.683	0.025	27.455	0.000	
Correlation Coefficient R= 0.835			Standard Error for the model= 0.19090		
Coefficient of Determination R ² = 0.697			Asymptotic Significance for the Model		
Calculated Value F= 753.78			Sig= 0.000		

Source: Results of the statistical analysis

From the previous table (10) we find that:

- The value of the asymptotic significance for the model is (Sig=0.000) which is less than the level of significance ($\alpha= 0.05$) and therefore the alternative hypothesis is accepted that, there is statistically significant

impact of Artificial Intelligence and its dimensions (neural networks, expert systems, smart agent and genetic algorithms) on digital marketing from the point of view of online banking clients.

- The linear correlation coefficient between artificial intelligence and digital marketing is (0.835), which is a positive correlation with statistical significance. And We find that the coefficient of determination is (0.697), which means that 69.7% of the change in digital marketing is due to the change in artificial intelligence.
- We find that the standard error of the model is (0.19090) which is a small value and this indicates the predictive ability of the model.
- We conclude that: The alternative hypothesis is accepted that "there is a statistically significant positive impact for Artificial Intelligence and its dimensions (neural networks, expert systems, smart agent and genetic algorithms) on digital marketing from the point of view of online banking clients with a confidence level of 95%.
- Correlation coefficients are found between the independent variables related to Artificial Intelligence dimensions, as shown in the following table (11):

Table 11: Results of the correlation coefficients between explanatory variables (dimensions of Artificial Intelligence)

dimension	Artificial Neural Networks	Expert Systems	Intelligences Agents	Genetic Algorithms
Artificial Neural Networks	1			
Expert Systems	0.751	1		
Intelligences Agents	0.644	0.684	1	
Genetic Algorithms	0.579	0.634	0.570	1

Source: Results of the statistical analysis

From the previous table, we find that the correlation coefficients are less than 0.8 between the independent variables (dimensions of Artificial Intelligence), and therefore we find that there is no problem of multicollinearity between the explanatory variables, and therefore the multiple regression method can be applied.

- Results of multiple regression analysis for the effect of dimensions of artificial intelligence on the digital marketing as shown in table (12):

Table 12: Results of multiple regression analysis for the effect of dimensions of Artificial Intelligence on the digital marketing

Explanatory Variables	Regression coefficient	Standard error	Calculated T value	The Asymptotic Significance (Sig)	Ranking	The value of the variance inflation factor (VIF)	Allowable variance value (Tolerance)
A. Neural Networks	0.212	0.037	5.948	0.000	2	2.533	0.396
Expert Systems	0.279	0.036	7.495	0.000	1	2.955	0.339
Intelligences Agents	0.188	0.032	6.094	0.000	3	2.112	0.475
Genetic Algorithms	0.039	0.023	1.764	0.079	-	1.813	0.552
Constant=				1.152			
Correlation Coefficient R=				0.854			
Coefficient of Determination R ² =				0.729			
Adjusted Coefficient of Determination R ² adj=				0.727			
Standard Error for the model=				0.18121			
Calculated Value F=				218.895			
Asymptotic Significance for the Model (Sig)=				0.000			

Source: Results of the statistical analysis

From Table (12) above we find that:

- The value of the asymptotic significance for the model is (Sig = 0.000), which is less than the significance level ($\alpha = 0.05$) and therefore the alternative hypothesis that the explanatory variables effect on the dependent variable (Digital Marketing) is accepted with a confidence level of 95%.
- The value of the asymptotic significance of artificial intelligence (artificial neural networks, expert systems and intelligences agents) is (Sig=0.000), which is less than the level of significance ($\alpha = 0.05$) and therefore the alternative hypothesis is accepted partially, that means there is statistically significant positive effect for the dimensions of artificial intelligence on the digital marketing from the point of view of online banking clients, with a confidence level of 95%.
- We find that the multiple correlation coefficient between the actual value and the predictive value of the dependent variable (digital marketing) is (0.854), which is a positive statistically significant relationship.

- We find that the adjusted coefficient of determination (R^2 adj) is (0.729), which means that (72.9%) of the change in digital marketing is due to the change in the explanatory variables.
- We find that the standard error of the model is (0.18121), which is a small value, and this indicates the predictive ability of the model.
- We find that the variance inflation factor (VIF) is less than (10) and the value of the allowable variance (Tolerance) is greater than (0.05) for all variables in the model, and this confirms the absence of the problem of multicollinearity.
- We find that the dimension of expert systems has greatest impact on digital marketing then the dimension of artificial neural networks, then the dimension of intelligences agents.

3. The third main hypothesis:

The third main hypothesis (H_3) investigates the impact of artificial intelligence and its dimensions (neural networks, expert systems, smart agents, and genetic algorithms) on customer engagement from the point of view of online banking clients. The validity of this hypothesis is tested using the simple linear regression method as follows:

Table 13: Results of the simple linear regression analysis for artificial intelligence on customer engagement

Variables	Regression Coefficient	Standard Error	Calculated Value (T)	Asymptotic Significance (Sig)	Decision
Constant	1.032	0.129	8.032	0.000	Significant
Artificial Intelligence	0.747	0.033	22.662	0.000	
Correlation Coefficient $R= 0.781$			Standard Error for the model= 0.25291		
Coefficient of Determination $R^2 = 0.610$			Asymptotic Significance for the Model		
Calculated Value $F= 513.548$			Sig= 0.000		

Source: Results of the statistical analysis

From the previous table (13) we find that:

- The value of the asymptotic significance for the model is (Sig=0.000), which is less than the level of significance ($\alpha=0.05$), and therefore the alternative hypothesis is accepted that there is a statistically significant impact of artificial intelligence and its dimensions (neural networks,

- expert systems, smart agents, and genetic algorithms) on customer engagement from the point of view of online banking clients.
- The linear correlation coefficient between artificial intelligence and customer engagement is (0.781), which is a positive correlation with statistical significance. And we find that the coefficient of determination is (0.610), which means that 61% of the change in customer engagement is due to the change in artificial intelligence.
 - We find that the standard error of the model is (0.25291), which is a small value, and this indicates the predictive ability of the model.
 - We conclude that the alternative hypothesis is accepted that "there is a statistically significant positive impact of artificial intelligence and its dimensions (neural networks, expert systems, smart agents, and genetic algorithms) on customer engagement from the point of view of online banking clients with a confidence level of 95%.
 - Results of multiple regression analysis for the effect of dimensions of Artificial Intelligence on Customer Engagement as shown in table (14):

Table 14: Results of multiple regression analysis for the effect of dimensions of artificial intelligence on the customer engagement

Explanatory Variables	Regression coefficient	Standard error	Calculated T value	The Asymptotic Significance (Sig)	Ranking	The value of the variance inflation factor (VIF)	Allowable variance value (Tolerance)
A. Neural Networks	0.206	0.047	4.285	0.000	2	2.533	0.396
Expert Systems	0.321	0.052	6.334	0.000	1	2.955	0.337
Intelligences Agents	0.196	0.043	4.638	0.000	3	2.111	0.475
Genetic Algorithms	0.057	0.031	1.912	0.057	-	1.815	0.552
Constant=				0.902			
Correlation Coefficient R=				0.796			
Coefficient of Determination R ² =				0.634			
Adjusted Coefficient of Determination R ² adj=				0.630			
Standard Error for the model=				0.2461			
Calculated Value F=				140.940			
Asymptotic Significance for the Model (Sig)=				0.000			

Source: Results of the statistical analysis

From Table (14) above we find that:

- The value of the asymptotic significance for the model is (Sig = 0.000), which is less than the significance level ($\alpha= 0.05$) and therefore the alternative hypothesis that the explanatory variables affect the dependent variable (Customer Engagement) is accepted with a confidence level of 95%.
- The value of the asymptotic significance of Artificial Intelligence (artificial neural networks, expert systems and intelligences agents) is (Sig=0.000), which is less than the level of significance ($\alpha= 0.05$) and therefore the alternative hypothesis is accepted partially. that means there is statistically significant positive effect for the dimensions of artificial intelligence on the customer engagement from the point of view of online banking clients, with a confidence level of 95%.
- We find that the multiple correlation coefficient between the actual value and the predictive value of the dependent variable (customer engagement) is (0.796), which is a positive statistically significant relationship.
- We find that the adjusted coefficient of determination (R^2 adj) is (0.630), which means that (63%) of the change in customer engagement is due to the change in the explanatory variables.
- We find that the standard error of the model is (0.2461), which is a small value, and this indicates the predictive ability of the model.
- We find that the variance inflation factor (VIF) is less than (10) and the value of the allowable variance (Tolerance) is greater than (0.05) for all variables in the model, and this confirms the absence of the problem of multicollinearity.
- We find that the dimension of expert systems has the greatest impact on digital marketing, then the dimension of artificial neural networks, and then the dimension of intelligent agents.

4. The fourth main hypothesis:

The fourth main hypothesis (H_4) investigates the impact of digital marketing on customer engagement from the point of view of online banking clients. The validity of this hypothesis is tested using the simple linear regression method as follows:

Table 15: Results of the simple linear regression analysis for digital marketing on customer engagement

Variables	Regression Coefficient	Standard Error	Calculated Value (T)	Asymptotic Significance (Sig)	Decision
Constant	0.164	0.147	1.116	0.265	Significant
Digital Marketing	0.955	0.037	25.70	0.000	
Correlation Coefficient R= 0.817			Standard Error for the model= 0.2334		
Coefficient of Determination R ² = 0.668			Asymptotic Significance for the Model		
Calculated Value F= 660.452			Sig= 0.000		

Source: Results of the statistical analysis

From the previous table (15) we find that:

- The value of the asymptotic significance for the model is (Sig=0.000), which is less than the level of significance ($\alpha=0.05$), and therefore the alternative hypothesis is accepted that there is a statistically significant impact of digital marketing on customer engagement from the point of view of online banking clients.
- The linear correlation coefficient between artificial intelligence and customer engagement is (0.817), which is a positive correlation with statistical significance. And We find that the coefficient of determination is (0.668), which means that 66.8% of the change in customer engagement is due to the change in digital marketing.
- We find that the standard error of the model is (0.2334) which is a small value and this indicates the predictive ability of the model.
- We conclude that: The alternative hypothesis is accepted that "there is a statistically significant positive impact for digital marketing on customer engagement from the point of view of online banking clients with a confidence level of 95%.

5. The fifth main hypothesis:

SEM analysis aims to investigate the fifth main hypothesis (H₅), which examines the impact of Digital Marketing (M) on the relationship between Artificial Intelligence (X) and Customer Engagement (Y) from the point of view of online banking clients. AMOS V20 was used to analyze the collected data, and AMOS Graphic was used to draw a path diagram identifying main relationships.

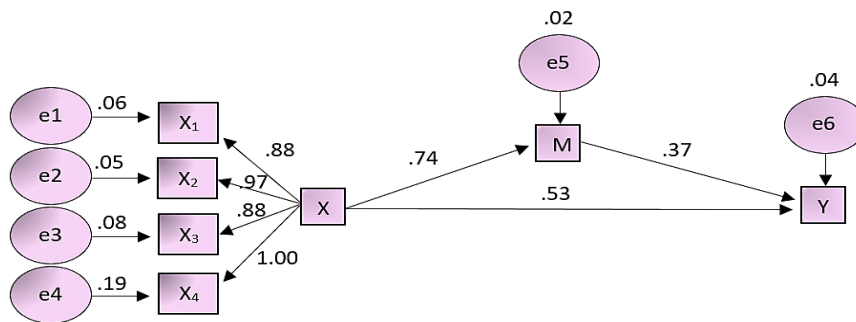


Figure 2: Path Diagram

Table 16: SEM results related to indirect impact of the artificial intelligence on customer engagement through digital marketing

Path	St. Beta	Sig	Mediation	
Artificial Intelligence → Digital Marketing	0.738	0.000	direct	Partial
Digital Marketing → Customer Engagement	0.376	0.000	direct	
Artificial Intelligence → Customer Engagement	0.527	0.000	direct	
(X) → (M) → (Y)	0.228	0.011	indirect	

From the statistical results shown in the above table (16) it can be noted that:

- Artificial Intelligence has a statistically significant positive indirect impact on customer engagement from the point of view of online banking clients through digital marketing (B = 0.228 with P < 0.05); this reflects that digital marketing reinforced the indirect effect of artificial intelligence on customer engagement (partial mediation).
- Results shown in the previous table (B= 0.228 with P< 0.05) strongly supported the fifth main hypothesis (H₅) which examine the impact of digital marketing on the relationship between artificial intelligence and customer engagement from the point of view of online banking clients with a confidence level of 95%.

6. The sixth main hypothesis:

The sixth main hypothesis (H₆) investigates the differences according to the opinions of online banking clients about study variables (artificial intelligence, digital marketing, and customer engagement) depending on their personal variables (gender and educational level) from the point of view of online banking clients.

– Regarding the Gender:

It is possible to determine the extent to which there are statistically significant differences in the average responses of the sample members to (artificial intelligence, digital marketing, and customer engagement) due to gender using the independent sample T-test, as those variables, as we have already mentioned, follow a normal distribution, as shown in the following table (17):

Table 17: Results of the independent sample T-test according to gender

Variables	Gender	Mean	Std. Error	T. Value	Sig
Artificial Intelligence	Male	3.9736	0.34388	0.805	0.423
	Female	3.9438	0.32867		
Digital Marketing	Male	3.8988	0.56189	0.617	0.617
	Female	3.8588	0.60118		
Customer Engagement	Male	3.9347	0.52595	0.471	0.640
	Female	3.9083	0.48430		

Source: Results of the statistical analysis

From the previous table, we find that the value of the asymptotic significance (0.423, 0.617, 0.640), which is greater than the level of significance, and therefore the null hypothesis is accepted that there are no statistically significant differences in the average responses of online banking clients about (artificial intelligence, digital marketing, and customer engagement) due to gender with a confidence level of 95%.

– Regarding the educational level:

It is appropriate to determine the extent to which there are significant differences in the average responses of the sample members to (artificial intelligence, digital marketing, and customer engagement) due to educational level, using the analysis of variance method as shown in the following table (18):

Table 18: Results of the analysis of variance according to qualification

Variables	educational level	Mean	F. Value	Sig
Artificial Intelligence	Intermediate qualification	4.0621	2.728	0.044
	University qualification	4.0034		
	Postgraduate studies	3.9448		
Digital Marketing	Intermediate qualification	4.1705	4.098	0.007
	University qualification	3.9378		
	Postgraduate studies	3.8618		
Customer Engagement	Intermediate qualification	4.2122	4.584	0.004
	University qualification	3.9920		
	Postgraduate studies	3.8889		

Source: Results of the statistical analysis

From the previous table, we find that the value of the asymptotic significance (0.044, 0.007, 0.004), which is less than the level of significance ($\alpha = 0.05$), and therefore the alternative hypothesis is accepted that there are statistically significant differences in the average responses of online banking clients about (artificial intelligence, digital marketing, and customer engagement) due to gender with a confidence level of 95%.

We conclude that the alternative hypothesis is accepted partially, that "there are statistically significant differences according to the opinions of online banking clients about study variables (artificial intelligence, digital marketing, and customer engagement) depending on educational level with a confidence level of 95%.

Study’s Implications and Future Research

In this part, both theoretical and practical implications of this study are discussed, and in addition, recommendations for future research are suggested.

A. Theoretical implications:

- This study added to artificial intelligence literature by proposing that artificial intelligence could directly and indirectly contribute to customer

engagement. This study suggests that artificial intelligence has a significant positive direct impact on customer engagement; this impact has not been sufficiently tested in previous studies.

- This study additionally indicated that artificial intelligence has a significant positive direct effect on digital marketing. This study examines how artificial intelligence can act as an antecedent to digital marketing; this contribution added to the literature by explaining how the dimensions of artificial intelligence may result in achieving digital marketing.
- This study contributes to the customer engagement literature by examining the direct impact of digital marketing on customer engagement. This study further clarifies how customer engagement is related to digital marketing.
- This study also contributes to customer engagement literature by investigating the positive indirect impact of artificial intelligence on customer engagement; this indirect effect is mediated by digital marketing. The current study theoretically develops and tests the mediating role of digital marketing in the relationship between the dimensions of artificial intelligence and customer engagement. The results of this study add to artificial intelligence literature and show the importance of artificial intelligence in achieving customer engagement through digital marketing.

B. Practical Implications:

Based on the results of the field study, a set of practical implications has been provided to help online banking managers (Project Management and E-Channels, Sales, Quality of services, Marketing, and Public Relations manager) and clients working in Egypt to benefit from this study:

- Using data analytics techniques to identify clients' behavior patterns and anticipate their needs.
- Employing artificial intelligence to customize offers and services based on each client's needs.
- Developing a chatbot to provide instant client support and enhance their experience.
- Developing neural network-based models to deliver personalized services that meet individual clients' needs.
- Using neural networks to predict future customer needs based on their past behavior patterns, such as offering special offers or new services.

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- Integrating neural networks into smart chat to improve customer engagement and provide immediate and accurate support.
 - Using neural networks to detect suspicious behavior patterns in financial transactions, enhancing clients' security.
 - Create expert systems that provide investment advice and financial analysis tailored to each client based on their financial data.
 - Use expert systems to provide accurate advice on loans, including available options and appropriate interest rates.
 - Employ expert systems to analyze economic and market trends and provide clients with detailed reports on the best investment opportunities.
 - Designing smart agents that are available across different channels, such as mobile applications and websites, making it easier for clients to access services.
 - Providing smart agents that provide immediate assistance 24/7 to resolve clients queries and issues.
 - Using machine learning techniques to personalize smart agent interactions based on each client's behavior and preferences.
 - Enabling smart agents to perform simple banking transactions such as money transfers and bill payments without the need for human intervention.
 - Using genetic algorithms to develop multiple investment strategies and improve the performance of clients' investment portfolios.
 - Personalization of financial products: Designing models based on genetic algorithms to customize financial products such as loans and insurance according to each client's needs.
 - Budget planning: Developing tools based on genetic algorithms to help clients plan their budgets and forecast future expenses.
 - Providing personalized content that matches each client's interests and needs based on their data.
 - Accurate data analysis: Using data analytics tools to understand clients' behavior and target marketing campaigns more effectively.
 - Strong social media presence: Creating campaigns to engage with clients on platforms such as Facebook, Instagram, and LinkedIn to increase awareness of online banking services.
 - Optimizing the online bank's website for search engines to ensure it appears in relevant search results and increasing visitors.
 - Smart chat technologies: Integrating online chat services to provide immediate support and response to clients' inquiries.

References:

- Abd alhalim, S. (2023). "Public Relations Practitioners' Awareness of the Role of Artificial Intelligence in Developing Digital Marketing Performance." **The Scientific Journal of Public Relations and Advertising Research**, 9 (25), 243-286.
- Abdou, S. A. (2023). "Determinants of Internet Banking Usage in Emerging Markets: Evidence from Egypt." **International Journal of Applied Economics, Finance and Accounting**, 17(2), 553-571.
- Abdul Halim, S. (2023). "Public Relations Practitioners' Awareness of the Role of Artificial Intelligence in Developing Digital Marketing Performance." **The Scientific Journal of Public Relations and Advertising Research**, 9 (25), 243-286.
- Abu-Farsakh, G., & Al-Rosan, S. (2019). Effect of Shell Curvature and Geometric Nonlinearity on Stress Concentration in Composite Thin-Shell Panels Having a Central Square Hole and Subject to Uniaxial Tension Loading. **Jordan Journal of Civil Engineering**, 13 (3).
- Ahmed, S., Bashir., Abdullah, D. (2018). The Contribution of Information Technology to Improving the Quality of Service in the Health Sector: A Case Study of the Public Hospital Institution Ben Omar Al-Jilani in El Oued" Master's thesis, University of Martyr Hama Lakhdar in El Oued, Faculty of Economics, Commerce and Management Sciences, Department of Management Sciences, Specialization Business Administration. Algeria.
- Al-Ajjal, A., Karima, J. (2015). "The Role of E-Marketing in Improving the Performance of Algerian Commercial Banks: A Statistical Analytical Study." **Journal of Finance and Markets**, Algeria, 2 (2), 26-44.
- Alnaas, H. (2021). "The Barriers of Adoption of E-Banking in the Libyan Banks: A Case Study of Commercial Banks in Tobruk City." **Open Journal of Business and Management**, 10 (1), 501-524.
- Al-Sayyed, S., Al-Aroud, S., & Zayed, L. (2021). "The Effect of Artificial Intelligence Technologies on Audit Evidence." **Accounting**, 7(2), 281-288.
- Al-Omari, H. (2021). "Artificial Intelligence and Its Role in International Relations." **Arab Journal of Scientific Publishing**, 6 (23), 307-321.
- Al-Taie, Y., & Al-Abbadi, H. (2010). Customer Relationship Management: Al-Warraq Foundation for Publishing and Distribution, 1st ed.
- Andrew, D., Andrew, P., Audrey, L., & Yan-Hui. (2020). "The Inexorable Rise of the Robots: Trade Journals: Framing of Machinery in the Workplace." *journalism*, 1–18.
- Anouze, A. L. M., & Alamro, A. S. (2019). "Factors Affecting Intention to Use e-Banking in Jordan." **International Journal of Bank Marketing**, 38(1), 86-112.

- Ali, S. A. S., Eldaw, K. E. H. I., Alsmadi, M. K., and Almarashdeh, I. (2019). “Determinants of Deposit of Commercial Banks in Sudan: An Empirical Investigation (1970-2012).” **International Journal of Electronic Finance**, 9 (3), 230-255.
- Amina, M., Ikram, T., & Ikram, B. (2021). “Application of Artificial Intelligence and Emotional Intelligence in Decision Making.” **Knowledge Collections Magazine**, 7 (1), 1-6.
- Arif, I., Aslam, W., & Hwang, Y. (2020). “Barriers in Adoption of Internet Banking: A Structural Equation Modeling Neural Network Approach.” **Technology in Society**, 61(C), 1-19.
- Attia, A. (2022). The Impact of Digital Tourism Marketing on Algerian Tourist Behavior: A Study of a Sample of Tourists in Algiers. Master's Thesis, University of Arab Tebessi - Tebessa, Algeria.
- Bansal, R., & Chaudhary, K. (2016). “Customer Engagement—a Literature Review.” **Global International Research Thoughts**, 2 (1), 15-20.
- Beckers, S. F., Risselada, H., & Verhoef, P. C. (2014). “Customer Engagement: A New Frontier in Customer Value Management.” **Handbook of Service Marketing Research**, 2 (6), 97-120.
- Ben Jarwa, H. (2014). The Impact of Customer Relationship Marketing on the Competitiveness of Economic Institutions". Unpublished PhD Thesis, University of Algeria.
- Bhai, L. (2018). “E-Banking in India: Problems and Prospects.” **Technical Research Organization India**, 5 (1), 77-81.
- Bouzrab, K. E. (2019). Artificial Intelligence Applications as a Modern Trend to Enhance the Competitiveness of Business Organizations, Reading in the Indian Experience (Case Study of HDFC Bank), Arab Democratic Center for Strategic, Political and Economic Studies, First Edition, Berlin-Germany.
- Bowden, J. L. (2009). “The Process of Customer Engagement: A Conceptual Framework.” **Journal of Marketing Theory and Practice**, 17 (1), 63-74.
- Brodie, R. J., Hollebeek, L. D., Jurić, B., & Ilić, A. (2011). “Customer Engagement: Conceptual Domain, Fundamental Propositions, and Implications for Research.” **Journal of Service Research**, 14(3), 252-271.
- Brodie, R. J., Ilic, A., Juric, B., & Hollebeek, L. (2013). “Consumer Engagement in a Virtual Brand Community: An Exploratory Analysis.” **Journal of Business Research**, 66 (1), 105-114.
- Chan, N., & Guillet, B. (2011). “Investigation of Social Media Marketing: How does the Hotel Industry in Hong Kong perform in Marketing on Social Media Websites?”. **Journal of Travel & Tourism Marketing**, 28 (4), 345–368.

- Cleens, J., Dem, V., & Vandewalle, J. (2002). “On the Security of Today’s Online Electronic Banking Systems.” **Journal of Computers & Security**, 21 (3) 257–269.
- El Borsaly, A., & Mahni, E. (2022). “The Effect of Customer Engagement in the Relationship between Brand Commitment and Customer Retention.” **Scientific Journal of Business and Environmental Studies**, 13 (3), 557-615.
- Francois, S.; Renaud, V., & Gregoire, M. (2012). *The Digital Marketing. Eyeroolls. Paris.*
- Ghiselli, R., & Ma, J. (2015). “Restaurant Social Media Usage in China: A Study of Industry Practices & Consumer Preferences.” **Worldwide Hospitality & Tourism Themes**, 7 (3), 251–265.
- Gultom, J. B., Murwaningsari, E., Umar, H., & Mayangsari, S. (2021). “Reciprocal Use of Artificial Intelligence in Audit Assignments.” **Journal of Accounting, Business and Finance Research**, 11(1), 9-20.
- Hajjaj, I. (2021). "The Impact of Using Artificial Intelligence Tools on the Development of Digital Marketing (An Applied Study)." **The Scientific Journal of Business and Environmental Studies**, 12 (4), 376-427.
- Hao, F. (2020). “The Landscape of Customer Engagement in Hospitality and Tourism: A Systematic Review.” **International Journal of Contemporary Hospitality Management**, 32 (5), 1837-1860.
- Hilal, O. A., & Tantawy, A. A. (2022). “Entrepreneurial Marketing and Bank Performance in Egypt: Is Environmental Turbulence a Missing Link?”. **Journal of Entrepreneurship in Emerging Economies**, 14 (2), 252-273.
- Hollebeek, L D. (2012) “Exploring Customer Engagement: Consumer, Manager & Academic Conceptions” Sustainable Management and Marketing Conference ANZMAC.
- Kannan, P. K. (2017). “Digital Marketing: A framework, Review and Research Agenda.” **International Journal of Research in Marketing**, 34 (1), 22-45.
- Khan, M. F., & Jan, A. (2015). “Social Media and Social Media Marketing: A Literature Review.” **IOSR Journal of Business and Management**, 17(11), 12-15.
- Khan, H. F. (2021). “E-Banking System Benefits and Issues.” **Insights into Economics and Management**, 11, 38-48.
- Khawalid, A. B. (2019). Collective Book, "Applications of Artificial Intelligence as a Modern Trend to Enhance Competitiveness of Business Organizations," Arab Democratic Center for Strategic, Political, and Economic Studies, Berlin-Germany, Registration No. Political and Economic Studies.

- Kim, M. S., Shin, D. J., & Koo, D. W. (2018). “The Influence of Perceived Service Fairness on Brand Trust, Brand Experience, and Brand Citizenship Behavior.” **International Journal of Contemporary Hospitality Management**, 30 (7), 2603-2621.
- Kordi, J., Nouraie, M., & Moorineh, H. Y. (2014). “Investigating the Effect of Personal Factors on the Customers' Purchasing Decision. Kuwait Chapter of Arabian.” **Journal of Business and Management Review**, 33 (2530), 1-9.
- Kotler, P., Armstrong, G., Trifts, V., & Buchwitz, L. A. (2017). *Marketing: An Introduction, Updated Sixth Canadian Edition with Integrated B2B Case*. Pearson Canada.
- Lin, S. M. (2011). “Marketing Mix (7P) and Performance Assessment of Western Fast Food Industry in Taiwan: An Application by Associating DEMATEL and ANP.” **African Journal of Business Management**, 5(26), 10634-10644.
- Lin, W. R., Wang, Y. H., & Hung, Y. M. (2020). “Analyzing the Factors Influencing Adoption Intention of Internet Banking: Applying DEMATEL-ANP-SEM Approach.” **PLOS ONE**, 15(2), 1-25.
- Madushani, S., & Balendran, S. (2020). “Factors Influencing the Usage of Internet Banking in Puttalam District of Sri Lanka.” **International Journal of Advance Research and Innovative Ideas in Education**, 6(1), 64-75.
- Mohamed, M. (2015). “A Proposed Model for the Relationship between the Antecedents and Dimensions of Customer Engagement with the Application on Mobile Phone Service Companies’ Customers in Egypt.” **Journal of Business Research**, 37 (1), 497-532.
- Mohammed, M. S., Abdul Al-Tawab, S., & Al-Bashlawy, A. M. (2023). “The Role of Digital Marketing in Making Purchase Decisions in the Real Estate Sector: An Applied Study on Real Estate Companies in Greater Cairo.” **The International Journal of Business Research and Studies**, 37 (1), 1019-1059.
- Mohamed, M. A. (2020). “The Impact of Digital Marketing on the Customer's Perceived Value: An Applied Study on Customers of Egyptian Airlines.” **Journal of Trade and Finance**, 40 (1), 53-112.
- Mostafa, R.B. (2020), “Mobile Banking Service Quality: A New Avenue for Customer Value Co-Creation.” **International Journal of Bank Marketing**, 38 (5), 1107-1132.
- Moulay, A., Ikram, T., & Ikram, B. (2021). "Application of Artificial Intelligence and Emotional Intelligence in Decision-Making." **Journal of Knowledge Groups**, 7 (2), 187-205.
- Mswahili, A. (2021). “Factors Affecting the Adoption and Use of Internet Banking in Tanzania.” **The Journal of Informatics**, 1 (1), 58-79.

- Muhammad, H. S. (2023). “The Impact of Using Digital Marketing in Building a Sustainable Competitive Advantage for Traditional Aswan Products: A Field Study, Faculty of Commerce, Beni Suef University.” **Journal of Financial and Trade Studies**, 33 (1), 192-254.
- Mutoni, D. (2018). The Effect of Digital Marketing on the Performance of Commercial Banks in Rwanda (Doctoral dissertation, University of Rwanda).
- Naqvi, M. H., Jiang, Y., & Naqvi, M. (2021). “Generating Customer Engagement in Electronic Brand Communities: A Stimulus Organism Response Perspective.” **Asia Pacific Journal of Marketing and Logistics**, 33 (7), 1535-1555.
- Nasr, E., & Helmy, M. (2018). Financial Inclusion through Digital Financial Services and Fintech: The Case of Egypt. Working Paper, CBE: Digital Financial Services (DFS) Working Group.
- Nethanathan, S., & Shanmugathas, S. (2018). “Exploring the Factors Influencing Adoption of Internet Banking in Jaffna District.” **Global Journal of Management and Business Research: E- Marketing**, 18 (5), 10-23.
- Parsons, A., Zeisser, M., & Waitman, R. (2017). “Organizing Today for the Digital Marketing of Tomorrow.” **Journal of Interactive Marketing**, 12(1), 31-46.
- Pawar & Amruta. (2014). Study of Effectiveness of Online Marketing on Integrated Marketing Communication. Master’s Degree, D.Y. Patil University, Navi Mumbai, India.
- Purwanto, A. (2022). “How do the roles of digital marketing and brand image affect food product purchase decisions? an Empirical Study on Indonesian SMEs in the Digital Era”. **Journal of Industrial Engineering & Management Research**, 3 (6), 34-41.
- Rao, S., Srivatsala, V., & Suneetha, V. (2016). Optimizing the Technical Ecosystem of Digital Marketing. In Artificial Intelligence and Evolutionary Computations in Engineering Systems: Proceedings of ICAIECES (691-703). Springer India.
- Reddy, G. (2017). Digital Marketing Impact on the Consumer Decision-Making Process in Nike's Customer Retail Operations in South Africa. Doctoral dissertation, University of Pretoria.
- Salam, O. M. (2021). “Measuring the Impact of Digital Marketing Dimensions on Gaining Customer Satisfaction: An Empirical Study on a Sample of Clients of the Egyptian General Company for Tourism and Hotels (EGOTH).” **Journal of Trade and Finance**, 41 (3), 107-165.
- Sashi, C. M. (2012). “Customer Engagement, Buyer-Seller Relationships, and Social Media.” **Management Decision**, 50 (2), 253-272.

- So, K. K., King, C., & Sparks, B. (2014). "Customer Engagement with Tourism Brands: Scale Development and Validation." **Journal of Hospitality & Tourism Research**, 38(3), 304-329.
- Stoffels, M. A. (2019). Artificial Intelligence in the Process Industries—Technology Overview, Case Studies, and Success Factors.
- Sundaram, R., Sharma, D., & Shakya, D. (2020). "Power of Digital Marketing in Building Brands: A Review of Social Media Advertisement." **International Journal of Management**, 11(4).
- Talikoti, S. C. (2019). Digital Marketing: The Vital Vitamin for Future Marketing. In Proceedings of the 10th International Conference on Digital Strategies for Organizational Success.
- Tooma, E. A., & Grosser, R. (2005). "Arab Africa International Bank: The Introduction of Smart Cards to the Egyptian Market." **Thunderbird School of Global Management**, Case A-06-05-0007.
- Vinerean, S., Cetina, I., Dumitrescu, L., & Tichindelean, M. (2013). "The Effects of Social Media Marketing on Online Consumer Behavior." **International Journal of Business and Management**, 8(14), 66.
- Vivek, S. D. (2009). A Scale of Consumer Engagement. The University of Alabama.
- Wagdi, O., & Fathi, A. (2023). "The Fintech Banking Role of Improving Banking Market Share in Emerging Markets: Evidence from Egypt." **Scientific Journal of Financial and Commercial Studies and Research**, 4 (2), 37-65.

Dr. Mamdouh Abd El- Fattah Ahmed Mohamed

Questionnaire Form

Dear Professor / Madam:

After Greetings,

I have prepared a survey related to a study on:

The Role of Digital Marketing in the Relationship between Artificial Intelligence and Customer Engagement

"An Analytical Study of the Opinions of a Sample of Online Banking clients"

Therefore, we place this questionnaire in your hands in order to survey your opinions and obtain information that serves the subject of our study. To complete the data, we ask you to kindly answer this questionnaire by marking the appropriate options. We all hope to benefit from your experiences, knowing that this information will never be used except for scientific research purposes.

Waiting for your answers, please accept our utmost appreciation and respect and thank you in advance for your cooperation.

Note: 1 (Totally disagree), 2 (Don't agree), 3 (Neutral), 4 (Agree), 5 (Totally agree)

Thank you for your kind cooperation.

Personal Traits:

Gender:	① Male	② Female	
Educational Level:	① Intermediate qualification	② University qualification	③ Postgraduate studies

Study Variables:

Artificial Intelligence

Artificial Neural Networks:

1.	The bank's website contains useful information. ① ② ③ ④ ⑤
2.	Networks improve the banking services provided and facilitate access to them. ① ② ③ ④ ⑤
3.	The network helps banks' clients reduce errors in completing transactions. ① ② ③ ④ ⑤
4.	The bank uses electronic means of communication to communicate with its clients. ① ② ③ ④ ⑤
5.	Networks provide banks' clients with multiple options as a result of their high ability to analyze information. ① ② ③ ④ ⑤

Expert Systems:

6.	The use of expert systems improves the bank's performance in providing various services. ① ② ③ ④ ⑤
7.	Expert systems act as expert advisors to clients and help them make decisions. ① ② ③ ④ ⑤
8.	I prefer to use expert systems because they can interpret reports from the bank. ① ② ③ ④ ⑤
9.	Expert systems help in managing clients' banking services and thinking processes. ① ② ③ ④ ⑤
10.	Expert systems work to create and innovate the banking services provided to clients. ① ② ③ ④ ⑤

Intelligences Agents:

11.	The intelligent agent helps the bank's clients make decisions based on the knowledge base stored in it. ① ② ③ ④ ⑤
12.	The intelligent agent reduces the time used by clients to reach the desired goals of their operations and services. ① ② ③ ④ ⑤
13.	An intelligent agent helps clients make decisions on their behalf as an agent in certain predetermined customer situations. ① ② ③ ④ ⑤
14.	The Smart Agent can be used as an alternative to human agents, which reduces the cost of banking operations provided by the bank to clients. ① ② ③ ④ ⑤
15.	The Smart Agent helps improve the quality of banking services provided to clients. ① ② ③ ④ ⑤

Genetic Algorithms:

16.	Genetic algorithms help banks' clients find quick solutions in the changing environment. ① ② ③ ④ ⑤
17.	Genetic algorithms can be used to solve non-numeric options and problems. ① ② ③ ④ ⑤
18.	Genetic algorithms develop themselves and adapt to the environment to keep pace with developments that suit the needs of clients. ① ② ③ ④ ⑤
19.	Genetic algorithms are an excellent way to help clients manage banking operations and reach quick results. ① ② ③ ④ ⑤
20.	Genetic algorithms help reduce the cost of banking services provided to a bank's clients. ① ② ③ ④ ⑤

Digital Marketing

21.	The bank provides digital advertising windows that help attract and entice its clients. ① ② ③ ④ ⑤
22.	The bank conducts continuous and periodic promotional campaigns to attract the largest possible number of clients. ① ② ③ ④ ⑤

23.	The bank uses the Facebook page to discuss and launch digital applications. ① ② ③ ④ ⑤
24.	The bank is constantly updating content published on its website to retain clients. ① ② ③ ④ ⑤
25.	The bank takes into account the security features of clients when marketing its services digitally. ① ② ③ ④ ⑤
26.	The bank gives incentive rewards to retain its clients and ensure their loyalty to it. ① ② ③ ④ ⑤
27.	The bank uploads information quickly to clients dealing with it digitally. ① ② ③ ④ ⑤
28.	The bank uses digital channels to learn about clients' preferences and purchasing behavior. ① ② ③ ④ ⑤
29.	The bank conducts online research and surveys to learn about its clients' preferences. ① ② ③ ④ ⑤
30.	The bank relies on clients' feedback to develop and improve its services. ① ② ③ ④ ⑤
31.	The bank's website is designed according to the preferences and desires of its clients. ① ② ③ ④ ⑤
32.	The bank uses emails to update information about its new services. ① ② ③ ④ ⑤
33.	The bank dedicates representatives to communicate and interact directly with clients via its website. ① ② ③ ④ ⑤
34.	The bank adopts the on-demand service feature in marketing the service to clients. ① ② ③ ④ ⑤
Customer Engagement	
35.	I consider myself loyal to my bank. ① ② ③ ④ ⑤
36.	I have no intention of changing the bank where I deal. ① ② ③ ④ ⑤
37.	I am willing to pay a higher price for my bank compared to other banks that have similar features. ① ② ③ ④ ⑤
38.	I advise my friends and acquaintances to deal with my favorite bank because it is the best. ① ② ③ ④ ⑤
39.	I often speak positively about my bank and point out its advantages to others. ① ② ③ ④ ⑤
40.	I feel comfortable continuing to deal with my favorite bank. ① ② ③ ④ ⑤
41.	The bank offers me a package of integrated services that is the best among all banks. ① ② ③ ④ ⑤
42.	I prefer to continue my relationship with my favorite bank, and I advise others to deal with it. ① ② ③ ④ ⑤
43.	I prefer to deal with my favorite bank regardless of the cost. ① ② ③ ④ ⑤
44.	I care a lot about anything related to my cosmetics brand. ① ② ③ ④ ⑤

دور التسويق الرقمي في العلاقة بين الذكاء الاصطناعي وارتباط العملاء:

دراسة تحليلية لآراء عينة من عملاء الخدمات المصرفية عبر الإنترنت

المستخلص:

استهدفت الدراسة التعرف على دور التسويق الرقمي في العلاقة بين الذكاء الاصطناعي وارتباط العملاء من وجهة نظر عملاء الخدمات المصرفية عبر الإنترنت (٣٨٤ مفردة) وتحديد مدى تأثير المتغيرات الشخصية على اتجاهات عينة الدراسة. وفيما يتعلق بمتغيرات الدراسة، تم استخدام الاستبانة كأداة لجمع البيانات. تم تحليل البيانات باستخدام برنامج التحليل الإحصائي (SPSS 25)، ومن أهم النتائج التي توصلت إليها الدراسة أنه يوجد ارتباط ايجابي ذو دلالة إحصائية بين متغيرات الدراسة، وأنه يوجد تأثير ايجابي ذو دلالة إحصائية للذكاء الاصطناعي وأبعاده (الشبكات العصبية، والأنظمة الخبيرة، والوكلاء الأذكى، والخوارزميات الجينية) على التسويق الرقمي وارتباط العملاء. كما يوجد تأثير ايجابي ذو دلالة إحصائية للتسويق الرقمي على ارتباط العملاء. يوجد تأثير ايجابي ذو دلالة إحصائية للتسويق الرقمي على العلاقة بين الذكاء الاصطناعي وارتباط العملاء من وجهة نظر عملاء الخدمات المصرفية عبر الإنترنت بمستوى ثقة ٩٥٪، وأنه لا توجد فروق ذات دلالة إحصائية في متوسط استجابات المستقضي منهم حول متغيرات الدراسة وفقا للنوع، بينما تتحقق الفروق وفقا للمستوى التعليمي بمستوى ثقة ٩٥٪، وفي ضوء هذه النتائج يجب توظيف الذكاء الاصطناعي لتخصيص العروض والخدمات بناء على احتياجات كل عميل.

الكلمات المفتاحية: الذكاء الاصطناعي، ارتباط العملاء، التسويق الرقمي