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Artificial Intelligence and E-Marketing Performance: The Moderating Role of Digital Marketing Tools in Algerian E-commerce

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Abstract

E-commerce companies in Algeria have been facing challenging marketing conditions and an increasingly competitive environment. Hence, this descriptive analytical research investigates the impact of Artificial Intelligence (AI) on E-marketing performance in Algerian E-commerce companies. A conceptual model based on the existing literature was proposed. The model includes AI – as independent variables that affect E-marketing performance, measured through Click-Through Rate (CTR), Impression Rate (IR), and Conversion Rate as dependent variables. A questionnaire was distributed to 200 participants via Google Forms, using a non-probability purposive sampling technique. Structural Equation Modeling (SEM) with Partial Least Squares (PLS) was used for data analysis and hypothesis testing. Results demonstrated a significant effect of AI on E-marketing performance.

Keywords: *E-commerce companies; Artificial Intelligence (AI); E-marketing performance; Click-Through Rate (CTR); Structural Equation Modeling (SEM).*

Intelligence artificielle et performance du marketing électronique : le rôle modérateur des outils de marketing numérique dans le commerce électronique algérien

Résumé

Les entreprises de commerce électronique en Algérie sont confrontées à des conditions de commercialisation difficiles et à un environnement de plus en plus concurrentiel. Cette recherche descriptive et analytique examine donc l'impact de l'intelligence artificielle (IA) sur la performance du marketing électronique dans les entreprises de commerce électronique algériennes. Un modèle conceptuel basé sur la littérature existante a été proposé. Ce modèle inclut l'IA en tant que variable indépendante influençant les performances du marketing électronique, mesurées à l'aide du taux de clics (CTR), du taux d'impression (IR) et du taux de conversion en tant que variables dépendantes. Un questionnaire a été distribué à 200 participants via Google Forms, à l'aide d'une technique d'échantillonnage non probabiliste et raisonné. La modélisation par équations structurelles (SEM) avec les moindres carrés partiels (PLS) a été utilisée pour l'analyse des données et la vérification des hypothèses. Les résultats ont démontré un effet significatif de l'IA sur les performances du marketing électronique.

Mots-clés : *entreprises de commerce électronique ; intelligence artificielle (IA) ; performances du marketing électronique ; taux de clics (CTR) ; modélisation par équations structurelles (SEM).*

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Introduction

Artificial Intelligence (AI) is gradually transforming various industries worldwide. According to Deloitte (2017), only 17% of people remain unfamiliar with AI. AI refers to a system's ability to accurately comprehend external input, learn from it, and apply that knowledge to achieve specific performance goals through adaptive adjustments (Kaplan, 2019).

The use of AI in marketing has been identified as one of the most profitable and promising areas for business growth, offering high-income potential and success rates (Fagella, 2019). AI enables machines to perform tasks traditionally carried out by humans, such as effective dialogue, conversation, and empathetic behavior. A notable example of AI-driven transformation in marketing is the use of smart virtual assistants, which many businesses have already integrated into their digital marketing strategies to create new opportunities (Faruk et al., 2021).

Over the past two decades, AI has significantly reshaped marketing, as well as industries such as banking, healthcare, engineering, and education (Huang & Rust, 2018; Rust, 2020). Digital marketing, in particular, has the potential to impact consumers at specific times, in precise locations, and through targeted channels. Advancements in technology enable businesses to produce vast amounts of goods while simultaneously expanding marketing and advertising opportunities. Furthermore, the integration of big data with research on intelligent applications has led to significant industrial breakthroughs in digital marketing. AI plays a

crucial role in digital marketing, facilitating the creation of new business opportunities and improving overall marketing effectiveness.

Research Problem

In today's marketing, businesses must understand their target audience's needs and act quickly on that information. Companies without Artificial Intelligence (AI) in their marketing strategies struggle to make data-driven decisions (Camilleri, 2017). AI helps businesses predict consumer behavior across various platforms, aligning content with customer preferences to increase sales (Dwivedi, 2020).

AI is vital throughout the e-commerce process, from awareness to purchase and post-purchase activities (Mangiaracina et al., 2009). However, despite claims of offering personalized experiences, the true nature of customization in e-commerce remains unclear. Marketers familiar with AI systems and digital marketing tools are more likely to run effective campaigns while understanding the technology's limitations.

A research gap exists in this area. Current studies on AI's impact on digital marketing are scattered, and there is limited empirical research on AI applications influencing e-marketing performance in Algerian e-commerce companies. This study aims to fill this gap by exploring AI's role in enhancing e-marketing performance on Algerian e-commerce websites.

Research Questions

Based on the discussions above, the present study is guided by the following research questions:

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- What is the impact of Artificial Intelligence (AI) on e-marketing performance in Algerian e-commerce companies?
- How do AI-driven tools influence Click-Through Rate (CTR), Impression Rate (IR), and Conversion Rate (CR) in the context of Algerian e-commerce?
- To what extent do Algerian e-commerce companies integrate AI systems into their marketing strategies to enhance customer engagement and sales performance?
- How do AI applications in digital marketing contribute to addressing the challenges and competitive pressures faced by Algerian e-commerce companies?
- How do digital marketing tools (like SEO and social media) affect the relationship between AI applications and e-marketing performance?

Research Objectives

The study aims to achieve the following objectives:

- To investigate the impact of Artificial Intelligence (AI) on e-marketing performance in Algerian e-commerce companies.
- To examine how AI-driven tools affect key e-marketing performance metrics, including Click-Through Rate (CTR), Impression Rate (IR), and Conversion Rate (CR) in Algerian e-commerce companies.
- To explore the level of AI integration in digital marketing strategies employed by Algerian e-

commerce companies to improve customer engagement and business outcomes.

- To identify the role of AI applications in addressing the marketing challenges and competitive pressures faced by e-commerce companies in Algeria.
- To assess the moderating role of digital marketing tools on the relationship between AI components and e-marketing performance.

Research hypotheses

Based on the research questions, research objectives, and literature review, the present study proposes the following research hypotheses:

- H1: Deep Learning has a positive and significant impact on e-marketing performance in Algerian e-commerce companies.
- H2: AI-driven Chatbots have a positive and significant impact on e-marketing performance in Algerian e-commerce companies.
- H3: AI-powered Customization has a positive and significant impact on e-marketing performance in Algerian e-commerce companies.
- H4: Digital marketing tools significantly moderate the relationship between Deep Learning and e-marketing performance.
- H5: Digital marketing tools significantly moderate the relationship between AI-driven Chatbots and e-marketing performance.
- H6: Digital marketing tools significantly moderate the relationship between AI-powered Customization and e-marketing performance.

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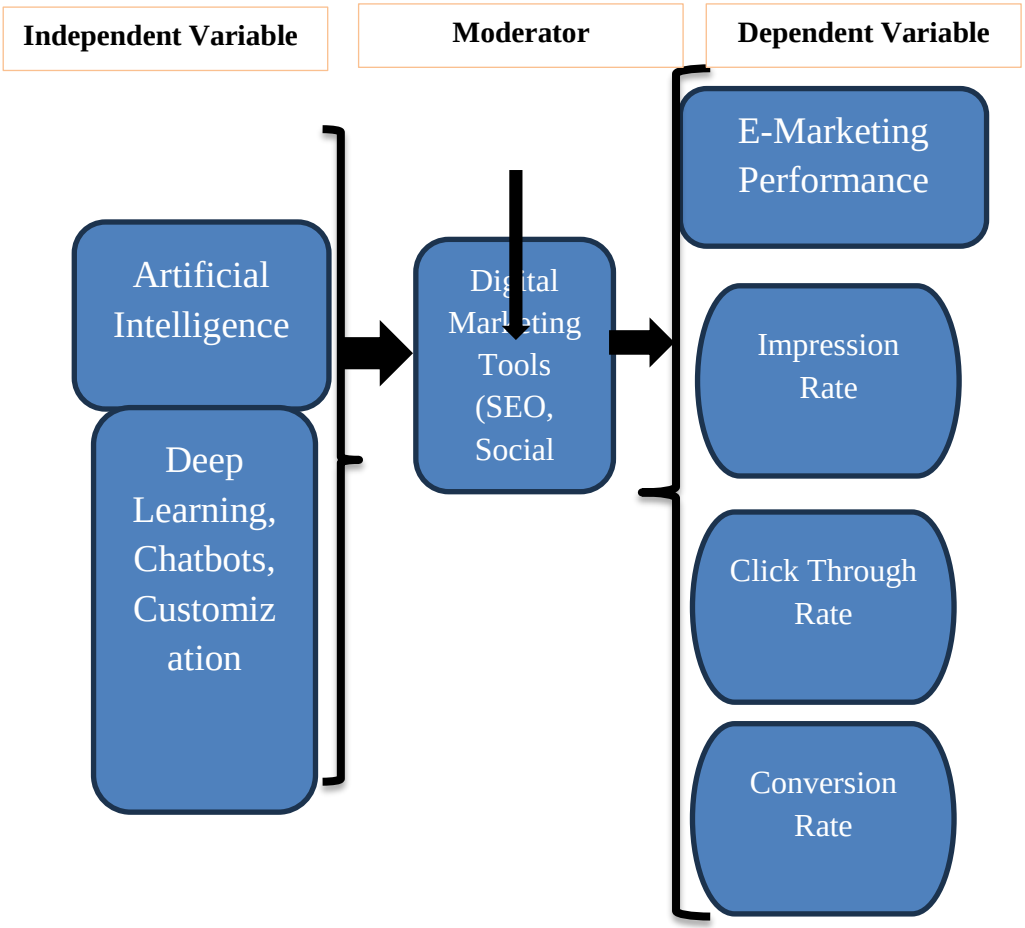
Conceptual and Operational Framework

- **Artificial Intelligence (AI):** The concept and development of computer systems capable of performing tasks that typically require human intelligence, such as language comprehension, decision-making, and visual or auditory recognition.
- **Deep Learning (DL):** A subset of AI used to manage real-time online advertisements, recognize and tag individuals in social media posts, convert speech to text, operate autonomous vehicles, and translate text into multiple languages.
- **Chatbot:** A simple yet common form of intelligent Human-Computer Interaction (HCI) and an example of AI-driven automated communication.
- **Customization:** The process of modifying products or services to meet specific customer needs.
- **Digital Marketing Tools:** Techniques and platforms used to promote goods and services through digital channels such as websites, mobile applications, social media platforms, and search engines.
- **E-Marketing Performance:** The measurement of marketing effectiveness through data analysis and feedback on marketing strategies.
- **Impression Rate (IR):** The percentage of total available impressions that an advertisement receives.
- **Click-Through Rate (CTR):** The ratio of users who click on an advertisement compared to the total number of impressions.
- **Conversion Rate:** The percentage of users who complete a desired action, such as making a purchase or signing up for a service.

Figure 01: Research model



1. Theoretical Framework and Literature Review

This Section discusses the theoretical concepts that form the backbone of this study. It provides comprehensive definitions of the variables used in this research and reviews past relevant studies. Additionally, the development of the study hypotheses is explored.

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1.1. Theoretical Background

1.1.1. Artificial Intelligence

According to Russell and Norvig (2016), Artificial Intelligence (AI) is a system that collects data and performs intelligent actions to maximize success. AI research dates back to the 1950s when Alan Turing introduced the Turing Test, which proposed evaluating whether machines can think. AI has significantly influenced various industries worldwide, offering rapid solutions to complex problems.

Investment in AI has been increasing exponentially. Rosenberg (2018) estimated that global AI investment would surpass $100 billion by 2025, a significant jump from the $2 billion spent in 2015. AI is particularly valuable in sales, marketing, production, and supply chain management (Chui et al., 2018). Digital marketing and E-commerce platforms benefit greatly from AI applications, as they can analyze customer behavior, personalize product recommendations, and optimize pricing and promotions.

Huang & Rust (2019) argue that sales and marketing professionals must adapt to AI-driven transformations. AI, robotics, and machine learning will **accelerate automation**, potentially replacing traditional sales and marketing roles. AI can dynamically adjust websites based on **user engagement patterns**, such as eye-tracking data and browsing behavior. Therefore, marketing professionals must **continuously update their skills** and leverage AI tools for creativity, design, and innovation (Alkhayyat & Ahmed, 2021).

AI assists marketing managers with various tasks, including **market research, social media management, lead**

generation, and campaign optimization (Davenport, 2018). The integration of AI in marketing offers numerous benefits, such as:

1. **Increased efficiency**—reducing time and effort in marketing functions.
2. **Higher conversion rates**—optimizing customer interactions.
3. **Better decision-making**—by analyzing customer data and insights.
4. **Improved product development**—leading to higher customer satisfaction (Eliza & Elena, 2019).

1.1.2. Deep Learning

Deep Learning (DL) is a subset of AI that enhances **real-time online advertising, image recognition, speech-to-text conversion, autonomous vehicles, and multilingual translations**. Various industries leverage DL to improve efficiency. For instance, hospitals utilize DL for **disease diagnosis and treatment planning**, while banks use it for **fraud detection and risk analysis** (Schmid, 2015).

In marketing, Deep Learning facilitates **advanced audience segmentation** and **predictive lead generation** based on past behavior (Fagella, 2019). In **E-commerce**, DL enhances:

- **Personalized shopping experiences**
- **Product recommendations**
- **Inventory optimization**
- **Security and fraud detection**

DL has been widely adopted in applications such as **text mining, spam detection, video recommendations, and multimedia retrieval** (Alkhayyat & Ahmed, 2021). The growth of **High-Performance Computing (HPC)** and **Big**

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Data analytics has further accelerated research in DL and distributed learning (Rozenwald et al., 2020). DL techniques have achieved outstanding results in **speech processing, visual data analysis, and Natural Language Processing (NLP)** (Hossain et al., 2019).

1.1.3. Chatbots

Chatbots are among the most **common AI applications in Human-Computer Interaction (HCI)** (Bansal & Khan, 2018). They leverage **Natural Language Processing (NLP)** to understand human input and respond appropriately (Khanna et al., 2015).

According to Abu Shawar & Atwell (2007), chatbots serve various purposes, including:

- **Customer support**—assisting users in e-commerce and business applications.
- **Information retrieval**—answering FAQs and providing recommendations.
- **Marketing automation**—enhancing user engagement and brand interaction.

Mahbub (2022) highlights several advantages of chatbots:

- **Instant accessibility** across multiple platforms without requiring installations.
- **Automated re-engagement** of inactive users through notifications.
- **Integrated payment systems** for secure transactions.
- **Personalized user interactions**, improving conversion rates.

Chatbots **enhance marketing activities** by interpreting customer intent and tailoring responses accordingly. They also facilitate **automated content recommendations** and

social media engagement, strengthening brand-consumer relationships (Alkhayyat & Ahmed, 2021).

1.1.4. Customization

Customization in marketing **enhances customer engagement and brand loyalty**. Personalized communication **reduces information overload**, making it easier for customers to make purchase decisions. Companies integrating AI-powered customization benefit from:

- **Improved customer retention**
- **Higher engagement rates**
- **Increased sales and revenue**

E-commerce platforms such as **Amazon and SHEIN** use AI-driven customization to tailor:

- **Product recommendations**
- **Pricing strategies**
- **Targeted promotions**

Customization also plays a key role in **Human-Computer Interaction, Machine Learning, and Data Mining** (Zanker et al., 2019). In marketing, **customization helps deliver the right message to the right person at the right time** (Aguirre et al., 2015; Dangi & Malik, 2017)

1.2. E-Marketing Performance

Marketing performance measurement has been a **key research area** in business studies, with scholars emphasizing the need to **link marketing metrics to firm performance** (Clark, Abela, & Ambler, 2006). During economic downturns, businesses **optimize their marketing budgets** by focusing on measurable digital marketing strategies (Seggie et al., 2007; Morgan, 2012).

Performance Marketing in the Digital Era

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Performance marketing involves **advertising strategies where brands pay based on specific user actions**, such as:

- **Clicks**
- **Impressions**
- **Shares**
- **Sales conversions**

Unlike traditional advertising, **performance-based marketing** allows businesses to precisely track **ROI (Return on Investment)**, **customer acquisition**, and **ad efficiency**. Performance marketing leverages platforms such as:

- **Social media ads**
- **Search engine advertising (Google Ads, Bing Ads)**
- **Sponsored content and influencer marketing**

By utilizing **performance-based metrics**, companies can **scale their advertising efforts**, optimize campaigns, and target new audiences more effectively.

Key E-Marketing Performance Metrics

This study examines **three critical metrics** in measuring E-marketing performance:

1) **Impression Rate (IR)**
   - **Definition**: The percentage of **total available impressions** an advertisement receives.
   - **Formula**: Impressions received ÷ Total eligible impressions.
   - **Importance**: Higher IR means **greater ad visibility and reach**.

Google Ads assigns **impression share** to the highest-ranked Shopping ad for an advertiser in a **single auction**, ensuring fair distribution of impressions among different ads (Liang et al., 2018).

2) **Click-Through Rate (CTR)**
   - **Definition**: The percentage of users who **click on an ad** after viewing it.
   - **Formula**: (Total clicks ÷ Total impressions) × 100.
   - **Factors affecting CTR**:
     - **Ad relevance**: How closely an ad matches user intent.
     - **Ad rank**: Determined by **quality score, bid amount, and relevance** (CPC budget).

CTR estimation plays a **crucial role in online advertising, recommendation systems, and web search algorithms** (Ren et al., 2020).

3) **Conversion Rate**
   - **Definition**: The percentage of users who **complete a desired action** (e.g., purchase, sign-up, download).
   - **Formula**: (Total conversions ÷ Total ad interactions) × 100.
   - **Importance**:
     - Helps marketers identify **valuable users**.
     - Optimizes ad targeting for **better campaign performance** (Ren et al., 2020).

Companies refine their **conversion funnel** using **Deep Learning models** to predict user behavior, personalize recommendations, and optimize ad placements.

1.3. Review of Previous Studies

Study 1: Impact of AI in Marketing on Business Performance (Kawabena & Yaw, 2023)

Objective: To examine the impact of **AI in marketing** on business performance.

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Method: A **survey of 225 small and medium enterprises (SMEs)** registered with the Ghana Enterprise Agency.
Findings:

- AI significantly impacts **financial performance, customer engagement, and internal business operations**.
- AI can enhance **customer engagement by analyzing social media interactions**.
- **Limitation:** The study was restricted to **SMEs in a single region**, limiting generalizability.

Study 2: AI in Digital Marketing – Evidence from Romania (Petronela & Mirona, 2023)
Objective: To analyze the significance and impact of **AI in Romanian digital marketing firms**.
Method: Online survey conducted among employees of **digital marketing agencies and social media platforms**.
Findings:

- AI is **widely adopted** to personalize content, improve campaign performance, and enhance user experience.
- **Romania is a leading market** in **Central and Eastern Europe** for digital ad spending.
- AI improves **data-driven marketing decisions**.

Study 3: AI and Digital Marketing Trends (Ibrahim, 2023)
Objective: To create a **scientific map** of **AI, machine learning, and digital marketing research**.
Method: Bibliometric analysis of **171 publications** from **2007 to 2023** in the **Scopus database**.
Findings:

- AI and machine learning are **core components** of modern **digital marketing strategies**.

- Key research areas include **AI-driven decision-making, e-commerce automation, and deep learning applications**.
- The **number of AI-related publications has surged since 2017**.

Study 4: AI's Impact on Digital Marketing (Shirsendu, 2023)

Objective: To assess **how digital marketers utilize AI to enhance performance**.

Method: Quantitative survey analyzed using statistical charts.

Findings:

- AI **automates marketing processes**, reducing **manual workload**.
- AI helps marketers **better understand and predict customer behavior**.
- **Conclusion:** AI **revolutionizes digital marketing** by improving efficiency and **enabling hyper-personalized campaigns**.

This section explored **E-marketing performance metrics**, including **Impression Rate, Click-Through Rate (CTR), and Conversion Rate**, highlighting their **importance in digital marketing success**. It also reviewed **empirical studies** on AI's impact on digital marketing, demonstrating its **growing role in customer engagement, content personalization, and campaign optimization**.

3. Research Methodology

3.0 Section Introduction

This section outlines the methodology adopted for this study, including the research design, population and sample, research instruments, data sources, questionnaire

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validation, pilot testing, and data analysis techniques. These elements are crucial to ensure methodological rigor and alignment with the research objectives, which focus on the relationship between Artificial Intelligence (AI) and e-marketing performance in Algerian e-commerce companies.

3.1 Research Design

This study adopts a **descriptive quantitative research design**, utilizing a **survey-based approach** for primary data collection. A structured questionnaire was developed to gather information on respondents' attitudes, behaviours, and perceptions regarding AI applications in digital marketing. Given that data were collected firsthand, they are considered **primary data**.

The research aimed to explore the relationship between Artificial Intelligence and e-marketing performance, with digital marketing tools acting as potential moderators in this relationship.

3.2 Research Population and Sample

The target population consists of digital and performance marketing employees working in Algerian e-commerce companies and marketing agencies. The sample was selected through non-probability purposive sampling, ensuring that participants met specific inclusion criteria (availability, accessibility, geographical proximity, and affordability).

Sampling Process

The research population was approximated from a list of around 100 notable Algerian e-commerce and marketing companies, including:

- **Yalidine, Ouedknis, inDrive, Kazitour, Safir Click, Createch, Evact, Diamond Agency, Yassir, Jumai Algerie, Batolis, Ubuy Algeria.**

Sampling was facilitated via contact with IT departments to retrieve relevant employee email addresses. The required minimum sample size was 92, calculated using G*Power software with the following parameters:

- F-test
- $\alpha = 0.05$
- Power = 0.95
- Effect size: medium
- Predictors: 3

However, based on Hair et al. (2010), more than 100 samples are advisable to mitigate low response rates in survey-based research. Therefore, 250 questionnaires were distributed, targeting 200 eligible respondents.

3.3 Research Instruments

Data were collected through a structured online questionnaire developed using Google Forms. The questionnaire was divided into two main sections:

1. **Demographic Information** – e.g., age, gender, education level.
2. **Study Constructs** – items measuring independent, dependent, and moderating variables.

Most items used 5-point Likert scales (1 = Strongly Disagree, 5 = Strongly Agree), except for the e-marketing performance scale, which used a 3-point Likert scale (Much Lower, Medium, Much Higher).

Each construct and corresponding measurement items were adapted from previous validated studies. These are summarised in the tables below.

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Table 3.1: Items Representing Deep Learning

Construct	Measurement Statement	Source
Deep Learning	1. Influences e-marketing performance	Schmidhuber (2015)
	2. Leads to higher impression rates	
	3. Enables content creation based on customer preferences	
	4. Enhances the success of digital ads	

Table 3.2: Items Representing Chatbots

Construct	Measurement Statement	Source
Chatbot	1. Influences e-marketing performance	Sterne (2017)
	2. Improves campaign performance	
	3. Enhances customer retention	
	4. Leads to higher conversion rates	

Table 3.3: Items Representing Customization

Construct	Measurement Statement	Source
Customization	1. Influences e-marketing performance	Pradeep et al. (2018)
	2. Increases click rates	
	3. Builds customer loyalty	
	4. Is a vital function in digital campaigns	

Table 3.4: Items Representing Social Media Marketing

Construct	Measurement Statement	Source
Social Media Marketing	1. Enhances e-marketing performance	Kaplan & Haenlein (2010)
	2. Update frequency influences performance	
	3. Number of followers affects performance	
	4. Responding to queries via social media increases performance	

Table 3.5: Items Representing Search Engine Optimization

Construct	Measurement Statement	Source
SEO	1. Influences e-marketing performance	Sharma & Verma (2020)
	2. On-page content volume impacts performance	
	3. Website load speed influences performance	
	4. Keyword relevance is a major factor	
	5. Age of the website influences visibility and reach	

Table 3.6: Items Representing Content Marketing

Construct	Measurement Statement	Source
Content Marketing	1. Creative content improves performance	Hollebeek & Macky (2019)
	2. AI facilitates high-quality content creation	
	3. Credibility of content	

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	affects marketing outcomes	
	4. Interactive content fosters audience engagement	

Table 3.7: Items Representing E-Marketing Performance

Construct	Measurement Statement	Source
E-Marketing Performance	1. AI applications improved conversion rates	Quinton & Wilson (2016)
	2. AI improved impression share	
	3. AI enhanced click-through rates	
	4. Overall e-marketing performance has increased	

In this study, Digital Marketing Tools (DMT) were conceptualized as a moderating variable. This moderator is a higher-order construct composed of three key dimensions measured in this research: **Social Media Marketing** (Table 3.4), **Search Engine Optimization** (Table 3.5), and **Content Marketing** (Table 3.6). This approach is taken because these tools represent the primary channels through which AI applications' effectiveness is amplified in a real-world digital marketing environment."

3.4 Data Sources

3.4.1 Secondary Data

Secondary data were obtained from scholarly sources including academic journals, conference proceedings, and textbooks relevant to AI, digital marketing, and e-commerce.

3.4.2 Primary Data

Primary data were collected via structured questionnaires designed specifically for this study and distributed to employees of e-commerce and marketing companies in Algeria.

A pilot study was conducted with 30 randomly selected respondents, as recommended by Hair et al. (2007). Respondents had three days to complete the questionnaire and were invited to provide suggestions. The purpose was to identify any ambiguities and assess instrument reliability using Cronbach's Alpha.

The reliability coefficients for the constructs ranged between **0.70 and 0.89**, surpassing the threshold of 0.70 (Tavakol & Dennick, 2011). Due to the limited sample size, **confirmatory factor analysis (CFA)** was not performed during the pilot stage but was planned for the full sample.

3.7 Data Analysis Method

Data were analysed using **SPSS (version 18)** and **SmartPLS (version 3.2.8)**.

Steps:

1. **Descriptive Statistics –** Response rate, demographics.
2. **Data Screening –** Check for missing values, outliers, multicollinearity.
3. **PLS-SEM Modelling –** To assess measurement and structural models.

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Justification for PLS-SEM:

- Effective for **complex models** with **mediators/moderators** (Preacher & Hayes, 2004).
- Suitable for **non-normal data** (Fornell & Bookstein, 1982).
- Provides flexibility in analysing **formative and reflective constructs** (Hulland, 1999).

Both **measurement model** (reliability, validity) and **structural model** (hypothesis testing via regression) were assessed using **SmartPLS**.

4. Data Analysis and Research Findings

4.0 Section Introduction

This section presents the results and findings of the study. It covers the data screening procedures (including handling missing values, outlier removal, and testing for normality), sample profile, descriptive statistics, measurement model assessment (CFA, validity, and reliability), structural model evaluation including hypothesis testing, and a final section summary.

4.1 Data Screening Process

Screening the data before analysis ensures the accuracy and appropriateness of the dataset. This involves identifying and addressing missing values, outliers, and non-normal distributions.

4.1.1 Replacement of Missing Values

Missing values were identified through frequency analysis. Any missing values were replaced with the mode of the respective items to ensure consistency.

4.1.2 Removal of Outliers

Univariate outliers were evaluated using z-scores, boxplots, and histograms. A value exceeding ±4.0 is considered an outlier (Hair et al., 2006). Table 4.1 shows all values were within acceptable ranges.

Table 4.1: Univariate Outliers Based on Standardized Values

Construct	Item	Lower Bound	Upper Bound
Deep Learning (DL)	DL1	-1.929	1.2498
	DL2	-2.154	1.429
	DL3	-2.056	1.463
	DL4	-1.923	1.235
Chatbot (CH)	CH1	-1.765	1.298
	CH2	-1.767	1.243
	CH3	-1.713	1.176
	CH4	-1.860	1.277
Customization (CS)	CS1	-1.763	1.295
	CS2	-1.764	1.244
	CS3	-1.715	1.175
	CS4	-1.870	1.276
Social Media Marketing (SMM)	SMM1	-2.025	1.834
	SMM2	-1.899	1.438
	SMM3	-1.898	1.436
	SMM4	-1.897	1.434
Search Engine Optimization (SEO)	SEO1	-2.125	1.561
	SEO2	-2.318	1.863
	SEO3	-2.301	1.886
	SEO4	-2.434	1.766
	SEO5	-2.876	1.956
Content Marketing (CM)	CM1	-2.027	2.203

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	CM2	-1.938	2.085
	CM3	-2.152	2.304
	CM4	-2.337	2.351
E-Marketing Performance (EMP)	EMP1	-2.224	1.675
	EMP2	-2.123	1.747
	EMP3	-2.097	1.658
	EMP4	-2.592	1.733

All z-scores were within the ±4.0 threshold, indicating the absence of univariate outliers.

4.1.3 Assessment of Data Normality

Normality was assessed using skewness and kurtosis. Ho (2006) and Olsson et al. (2000) recommend skewness < |2| and kurtosis < |7|. Table 4.2 presents the results.

Table 4.2: Assessment of the Normality of the Variables

Construct	Skewness	Std. Error (Skewness)	Kurtosis	Std. Error (Kurtosis)
Deep Learning	-0.553	0.190	-1.009	0.379
Chatbot	-0.568	0.190	-0.551	0.379
Customization	-0.503	0.190	-0.952	0.379
Social Media Marketing	-0.510	0.190	-0.877	0.379
Search Engine Optimization	-0.026	0.190	-0.849	0.379
Content Marketing	-0.023	0.190	-0.848	0.378
E-Marketing Performance	0.053	0.190	-1.003	0.379

The skewness and kurtosis values indicate that all constructs fall within the acceptable range, confirming univariate normality.

4.2 Sample Profile

A total of 200 respondents completed the questionnaire. The demographic details are shown in Table 4.3.

Table 4.3: Profile of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	117	58.5%
	Female	83	41.5%
Age	18–24	59	29.5%
	25–34	114	57.0%
	35–44	23	11.5%
	45–55	4	2.0%
Education	Diploma	25	12.5%
	Bachelor's	110	55.0%
	Master's	59	29.5%
	PhD	6	3.0%
Years of Experience	< 5 years	72	36.0%
	5 years	93	46.5%
	< 10 years	24	12.0%
	10 years	11	5.5%
Position	Digital Marketing	31	15.5%
	Performance Marketing	137	68.5%
	Social Media	21	10.5%
	Content Marketing	11	5.5%

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Of the 250 questionnaires distributed, 200 valid responses were analysed (response rate: 80%).

4.3 Descriptive Analysis

Descriptive statistics were computed for the main constructs using a 5-point Likert scale.

Table 4.4: Descriptive Statistics of Study Variables

Construct	Mean	Std. Deviation	Minimum	Maximum
Deep Learning	3.430	1.076	1.2	4.8
Chatbot	3.374	1.223	1.2	5.0
Customization	3.271	0.961	1.0	5.0
Social Media Marketing	3.252	0.942	1.2	5.0
Content Marketing	3.120	0.693	1.8	4.5
SEO	3.123	0.666	1.2	5.0
E-Marketing Performance	3.055	0.818	1.3	4.8

All means were above the neutral point (3.0), indicating generally positive responses. The highest variability was found in the Chatbot construct.

5. Data Analysis and Research Findings

5.1. Assessment of the Measurement Model

The measurement model was assessed using confirmatory factor analysis (CFA) to evaluate reliability and validity. Convergent validity was established through factor loadings, Average Variance Extracted (AVE), Composite

Reliability (CR), and Cronbach's Alpha. Discriminant validity was assessed using cross-loadings and the Heterotrait-Monotrait ratio (HTMT).

5.1.1. Convergent Validity

Table 4.5 displays the results of the CFA for the first-order constructs. All factor loadings exceed the threshold of 0.7. Cronbach's Alpha, CR, and AVE are above the recommended levels of 0.7, 0.7, and 0.5 respectively (Hair et al., 2010).

Table 5.1.1: Convergent Validity Results for the CFA Model

Construct	Item	Loading	CR	AVE	Cronbach's Alpha
Deep Learning	DL1	0.910	0.939	0.780	0.927
	DL2	0.896			
	DL3	0.887			
	DL4	0.881			
Chatbot	CH1	0.866	0.941	0.760	0.919
	CH2	0.873			
	CH3	0.877			
	CH4	0.785			
Customization	CU1	0.883	0.907	0.622	0.894
	CU2	0.881			
	CU3	0.880			
	CU4	0.882			
E-Marketing Performance	EMP1	0.879	0.946	0.780	0.932
	EMP2	0.878			
	EMP3	0.838			
	EMP4	0.860			
Social Media	SMM1	0.815	0.906	0.762	0.901

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Marketing	SMM2	0.856			
	SMM3	0.873			
	SMM4	0.875			
Content Marketing	CM1	0.850	0.844	0.731	0.839
	CM2	0.812			
	CM3	0.870			
	CM4	0.871			

5.1.2 Discriminant Validity

Discriminant validity was evaluated using cross-loadings and HTMT.

Table 5.1.2.: HTMT Results

Constructs	DL	CH	CU	SEO	SMM	CMP	EMP
Deep Learning (DL)	–	0.565	0.786	0.234	0.654	0.655	0.788
Chatbot (CH)		–	0.545	0.131	0.443	0.667	0.678
Customization (CU)			–	0.177	0.791	0.621	0.743
SEO				–	0.231	0.477	0.122
Social Media Marketing					–	0.554	0.632
Content Marketing (CM)						–	0.811
E-Marketing Performance							–

All HTMT values were below 0.90, affirming discriminant validity (Henseler et al., 2015).

5.2. Assessment of the Structural Model

Following the validation of the measurement model, the structural model was assessed using PLS-SEM with 1,000 bootstrapping iterations. Key statistics (R^2, path coefficients, t-values, p-values) were used to test hypotheses.

Table 5.2.: Hypotheses Testing Results

Hypothesis	Relationship	β	t-value	p-value	Decision
H1	Deep Learning → E-Marketing Perf	0.225	3.260	0.003	Supported
H2	Chatbot → E-Marketing Perf	0.633	2.472	0.000	Supported
H3	Customization → E-Marketing Perf	0.244	5.191	0.002	Supported
H4	DL * DMT → E-Marketing Perf	0.341	2.795	0.000	Supported
H5	CH * DMT → E-Marketing Perf	0.532	3.410	0.001	Supported
H6	CU * DMT → E-Marketing Perf	0.531	3.409	0.001	Supported

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All six hypotheses (H1–H6) were supported. Digital marketing tools (DMT) significantly moderated the relationship between AI dimensions (DL, CH, CU) and E-marketing performance.

5.3. Section Summary

This section presented the data analysis results in two phases. Phase one focused on data screening—missing value handling, outlier removal, and normality tests. Phase two employed PLS-SEM to assess the measurement and structural models.

Key findings:

- All constructs demonstrated adequate reliability and validity.
- AI components (Deep Learning, Chatbot, Customization) significantly impact E-marketing performance.
- Digital marketing tools play a significant moderating role in these relationships.

These outcomes validate the study model and confirm the importance of AI-enabled tools in enhancing digital marketing performance.

6. Discussion of Hypotheses Results

6.1. The Impact of Deep Learning on E-Marketing Performance

H1: Deep learning has a positive impact on e-marketing performance at a statistical significance level of $\alpha \leq 0.05$.

This hypothesis aligns with the first research objective: to examine the impact of deep learning on e-marketing performance in Algerian e-commerce companies. The results

confirmed a statistically significant and positive impact. This finding is consistent with previous studies by Kannan & Garad (2021), Halim et al. (2021), and Gazala (2022). These results suggest that applying deep learning enables marketers to better understand customer preferences, increasing impression rates and boosting overall marketing performance.

6.2. The Impact of Chatbots on E-Marketing Performance

H2: Chatbots have a positive impact on e-marketing performance at a statistical significance level of $\alpha \leq 0.05$.

This hypothesis corresponds to the second research objective: to investigate the impact of chatbots on e-marketing performance in Algerian e-commerce companies. The results confirmed a significant and positive relationship. Studies by Altuma & Alnasrawi (2023), Khan (2022), and Alaa A. & Dhamyaa N. (2022) support this outcome. Chatbots are beneficial to customers by providing immediate and interactive support, enhancing customer engagement, and increasing conversion rates.

6.3. The Impact of Customization on E-Marketing Performance

H3: Customization has a positive impact on e-marketing performance at a statistical significance level of $\alpha \leq 0.05$.

This hypothesis addresses the third research objective: to evaluate the impact of customization on e-marketing performance in Algerian e-commerce companies. The findings showed a statistically significant and positive relationship, supported by studies from Ansari (2021), Hernik et al. (2023), and Vincenycho & Candy Lan (2019). Customization aligns marketing messages with individual

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preferences, enhancing customer trust and purchase likelihood.

6.4. Moderating Role of Digital Marketing Tools: Deep Learning → E-Marketing Performance

H4: Digital marketing tools moderate the relationship between deep learning and e-marketing performance at a statistical significance level of $\alpha \leq 0.05$.

This hypothesis supports the fourth research objective: to explore the moderating role of digital marketing tools in the relationship between AI and e-marketing performance. The results confirmed the moderating effect, consistent with findings from Alkhayyat & Ahmed (2022), Malik H. (2019), and Dahan Lin (2022). Integrating digital marketing tools like SEO and social media platforms strengthens the link between deep learning applications and marketing performance.

6.5. Moderating Role of Digital Marketing Tools: Chatbots → E-Marketing Performance

H5: Digital marketing tools moderate the relationship between chatbots and e-marketing performance at a statistical significance level of $\alpha \leq 0.05$.

This hypothesis affirms the fifth objective. The results showed that digital marketing tools strengthen the influence of chatbots on performance. Similar findings were reported by Alkhayyat & Ahmed (2022), Shanh H. & Shynan L. (2022), and Eliza N., Adrian T., & Elena N. (2019).

6.6. Moderating Role of Digital Marketing Tools: Customization → E-Marketing Performance

H6: Digital marketing tools moderate the relationship between customization and e-marketing performance at a statistical significance level of $\alpha \leq 0.05$.

The results confirmed the hypothesis, which relates to the final objective. Studies by Alkhayyat & Ahmed (2022), Mahhima Sh. & Rahul G. (2022), and Sanaz KH (2021) provide supporting evidence. The findings show that digital tools enhance the impact of customization on marketing outcomes.

Summary of Hypothesis Testing

Table 6.6.: Summary of Hypotheses Testing Results

Hypothesis	Statement	Result
H1	Deep learning has a positive impact on e-marketing performance	Supported
H2	Chatbots have a positive impact on e-marketing performance	Supported
H3	Customization has a positive impact on e-marketing performance	Supported
H4	Digital marketing tools moderate the relationship between deep learning and e-marketing performance	Supported
H5	Digital marketing tools moderate the relationship between chatbots and e-marketing performance	Supported
H6	Digital marketing tools moderate the relationship between customization and e-marketing performance	Supported

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The study findings highlight that AI applications enhance e-marketing outcomes such as click-through rates, conversions, and impressions. Algerian e-commerce companies are encouraged to adopt AI tools such as deep learning and chatbots to gain a competitive edge.

6.7. Theoretical and Practical Implications

Theoretical Implications: This study makes several contributions to the academic literature. First, it provides crucial empirical evidence on the role of specific AI tools (Deep Learning, Chatbots, Customization) in an emerging market context (Algeria), a region that is underrepresented in digital marketing research. Second, by confirming the significant moderating role of Digital Marketing Tools, our research presents a more nuanced model that explains how AI's effectiveness is amplified, moving beyond simplistic direct-effect analyses.

Practical Implications: For e-commerce managers in Algeria, the findings offer a clear, data-driven directive. Investment in AI technologies directly translates to improved marketing performance. Specifically, managers should prioritize: (1) implementing chatbots for immediate customer support to boost conversion rates; (2) using deep learning for customer segmentation and ad targeting; and (3) leveraging customization to enhance customer loyalty. Crucially, the return on this AI investment is highest when integrated with a robust strategy for SEO, social media, and content marketing.

6.8. Limitations and Future Research

The conclusions of this study should be considered in light of its limitations. First, the non-probability sampling method limits the statistical generalizability of the findings to all Algerian e-commerce companies. Future research should endeavor to use a randomized sampling frame. Second, the study is cross-sectional, capturing a snapshot in time. A longitudinal study would be beneficial to track the impact of AI adoption over several years and establish causality more definitively. Finally, this study relied on the perceptions of marketing professionals. Future work could triangulate these findings with objective company data, such as web analytics and sales figures, to provide a more comprehensive view.

Conclusion

This study successfully validated a model demonstrating the impact of AI on e-marketing performance in Algerian e-commerce. The findings confirmed that AI components—specifically deep learning, chatbots, and customization—significantly enhance e-marketing outcomes. Furthermore, the study underscored the critical role of digital marketing tools as a moderator, amplifying the positive effects of AI. By bridging a gap in the literature concerning the Algerian market and providing actionable insights for practitioners, this research highlights the necessity for e-commerce companies to strategically integrate advanced AI technologies to maintain a competitive edge.

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References:

1. Aguirre, E., Mahr, D., Grewal, D., De Ruyter, K., & Wetzels, M. (2015). Unraveling the personalization paradox: The effect of information collection and trust-building strategies on online advertisement effectiveness. Journal of Retailing, 91(1), 34–49.
2. Alkhayyat, A., & Ahmed, A. M. (2022). The impact of artificial intelligence on digital marketing. [Conference/journal details needed].
3. Bansal, H., & Khan, R. (2018). A review paper on human computer interaction. International Journal of Advanced Research in Computer Science and Software Engineering, 8(4), 53.
4. Chui, M., Manyika, J., Miremadi, M., Henke, N., Chung, R., Nel, P., & Malhotra, S. (2018). Notes from the AI frontier: Applications and value of deep learning. McKinsey Global Institute.
5. Clark, B. H., Abela, A. V., & Ambler, T. (2006). An information processing model of marketing performance measurement. Journal of Marketing Theory and Practice, 14(3), 191–208.
6. Dangi, H., & Malik, A. (2017). Personalisation in marketing: An exploratory study. International Journal of Internet Marketing and Advertising, 11(2), 124–136.
7. Davenport, T. H. (2018). From analytics to artificial intelligence. Journal of Business Analytics, 1(2), 73–80.
8. Eliza, N., Adrian, T., & Elena, N. (2019). Artificial intelligence in electronic commerce: Basic chatbots and the consumer journey. Amfiteatru Economic, 21(52), 447–463.

9. Fagella, D. (2019). Machine learning marketing – Expert consensus of 51 executives and startups. Emerj Artificial Intelligence Research.
10. Faruk, M., Rahman, M., & Hasan, S. (2021). How digital marketing evolved over time: A bibliometric analysis on Scopus database. Heliyon, 7(12), e08558.
11. Gazala, M., Indhumathi, C., Malyadri, P., Mayi, K., Sumana, B. K., & Phasinam, K. (2022, June). Evaluating the performance of deep learning methods and its impact on digital marketing. In Proceedings of Second International Conference in Mechanical and Energy Technology: ICMET 2021, India (pp. 63–71). Springer.
12. Hair, J. F. (2009). Multivariate data analysis (7th ed.). Pearson. (Note: Your text cites this as Hair et al., 2010).
13. Hollebeek, L. D., & Macky, K. (2019). Digital content marketing's role in fostering consumer engagement, trust, and value: Framework, fundamental propositions, and implications. Journal of Interactive Marketing, 45, 27–41.
14. Hossain, E., Khan, I., Un-Noor, F., Sikander, S. S., & Sunny, M. S. H. (2019). Application of big data and machine learning in smart grid, and associated security concerns: A review. IEEE Access, 7, 13960–13988.
15. Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. Business Horizons, 53(1), 59–68.
16. Khanna, A., Pandey, B., Vashishta, K., Kalia, K., Pradeepkumar, B., & Das, T. (2015). A study of today's AI through chatbots and rediscovery of machine intelligence. International Journal of u- and e-Service, Science and Technology, 8(7), 277–284.

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17. Liang, X., Gao, Y., & Ding, Q. S. (2018). "What you measure is what you will get"?: Exploring the effectiveness of marketing performance measurement practices. Cogent Business & Management, 5(1), 1503221.
18. Pradeep, A. K., Appel, A., & Sthanunathan, S. (2018). AI for marketing and product innovation: Powerful new tools for predicting trends, connecting with customers, and closing sales. Wiley.
19. Quinton, S., & Wilson, D. (2016). Tensions and ties in social media networks: Towards a model of understanding business relationship development and business performance enhancement through the use of LinkedIn. Industrial Marketing Management, 54, 15–24.
20. Ren, J., Zhang, J., & Liang, J. (2018, July). Feature engineering of click-through-rate prediction for advertising. In International Conference in Communications, Signal Processing, and Systems (pp. 204–211). Springer. (Note: Your text cites this as Ren et al., 2020).
21. Rozenwald, M. B., Galitsyna, A. A., Sapunov, G. V., Khrameeva, E. E., & Gelfand, M. S. (2020). A machine learning framework for the prediction of chromatin folding in Drosophila using epigenetic features. PeerJ Computer Science, 6, e307.
22. Russell, S. J., & Norvig, P. (2010). Artificial intelligence: A modern approach (3rd ed.). Pearson. (Note: Your text cites this as Russell and Norvig, 2016).
23. Schmidhuber, J. (2015). Deep learning in neural networks: An overview. Neural Networks, 61, 85–117.

24. Seggie, S. H., Cavusgil, E., & Phelan, S. E. (2007). Measurement of return on marketing investment: A conceptual framework and the future of marketing metrics. Industrial Marketing Management, 36(6), 834–841.
25. Sterne, J. (2017). Artificial intelligence for marketing: Practical applications. Wiley.
26. Zanker, M., Rook, L., & Jannach, D. (2019). Measuring the impact of online personalization: Past, present and future. International Journal of Human-Computer Studies, 131, 160–168.