

Analyzing and evaluating the impact of using artificial intelligence technologies on improving digital marketing, enhancing consumer purchasing behavior, and fostering customer loyalty.

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ABSTRACT

The present study aimed to analyze and assess the contribution of digital technologies and artificial intelligence (AI) applications to improving marketing operations efficiency, enhancing customer experience, and strengthening consumer purchasing behavior and brand loyalty in Libyan companies and institutions. The study examined the relationships between digital marketing platform usage, AI technology adoption, marketing operations efficiency, customer experience enhancement, and AI-supported digital marketing effectiveness. A descriptive-analytical and applied research approach was adopted, using a structured questionnaire comprising 30 items distributed across five main dimensions. Data were collected from 250 participants working in marketing and customer service within Libyan institutions. Descriptive and inferential statistical techniques were employed, including Pearson's correlation analysis, multiple linear regression, independent-samples t-tests, and one-way analysis of variance (ANOVA). The findings indicated a high overall level of digital technology utilization and perceived marketing effectiveness ($M = 3.66, SD = 0.58$). AI-supported digital marketing effectiveness recorded the highest mean score ($M = 3.81, SD = 0.66$), whereas AI technology adoption demonstrated a moderate level ($M = 3.36, SD = 0.84$). Pearson correlation analysis revealed positive relationships among the study variables, with coefficients ranging from 0.60 to 0.72. The regression model explained approximately 63.6% of the variance in perceived AI-supported digital marketing effectiveness ($R^2 = 0.636, F = 107.02, p < 0.001$). Marketing operations efficiency demonstrated the strongest standardized regression coefficient ($\beta = 0.27$), followed by digital marketing platform usage ($\beta = 0.24$), customer experience enhancement ($\beta = 0.21$), and AI technology adoption ($\beta = 0.20$). Furthermore, statistically significant differences were identified according to job category ($p = 0.022$) and years of professional experience ($p = 0.003$), whereas gender ($p = 0.589$) and educational qualification ($p = 0.512$) showed no statistically significant differences. The study recommends

strengthening the integration of AI applications with digital marketing platforms, enhancing employees' competencies in consumer data analysis, developing personalized marketing campaigns, and providing specialized training to improve marketing operations and customer service performance in Libyan organizations.

المخلص

هدفت الدراسة إلى تحليل العلاقة بين توظيف تقنيات الذكاء الاصطناعي ومنصات التسويق الرقمي وفاعلية العمليات التسويقية، مع التركيز على تحسين تجربة العملاء ودعم السلوك الشرائي وتعزيز ولاء المستهلكين في الشركات والمؤسسات الليبية، واعتمدت الدراسة المنهج الوصفي التحليلي، باستخدام استبانة لجمع البيانات من عينة بلغت (250) مشاركاً من العاملين في مجالي التسويق وخدمة العملاء بالمؤسسات الليبية، كما استخدمت مجموعة من الأساليب الإحصائية، شملت المتوسطات الحسابية والانحرافات المعيارية ومعامل ارتباط بيرسون والانحدار الخطي المتعدد واختبار (t) وتحليل التباين الأحادي (ANOVA)، لتحليل البيانات واختبار العلاقات بين متغيرات الدراسة، أظهرت النتائج أن المستوى العام لتوظيف التقنيات الرقمية وفاعلية التسويق المدعوم بالذكاء الاصطناعي جاء مرتفعاً، بمتوسط حسابي بلغ (3.66)، كما سجل بُعد فاعلية التسويق الرقمي المدعوم بالذكاء الاصطناعي أعلى متوسط حسابي بلغ (3.81)، في حين جاء تبني تقنيات الذكاء الاصطناعي والتطبيقات الرقمية عند مستوى متوسط، بمتوسط بلغ (3.36). وكشفت النتائج عن وجود علاقات ارتباط موجبة ودالة إحصائية بين متغيرات الدراسة، كما أوضح نموذج الانحدار أن كفاءة العمليات التسويقية، واستخدام منصات التسويق الرقمي، وتحسين تجربة العملاء، وتبني تقنيات الذكاء الاصطناعي ترتبط إيجابياً بفاعلية التسويق الرقمي، وفسرت هذه المتغيرات مجتمعة نحو (63.6%) من التباين في الفاعلية المدركة للتسويق الرقمي المدعوم بالذكاء الاصطناعي، كذلك أظهرت النتائج وجود فروق ذات دلالة إحصائية وفقاً للفئة الوظيفية وسنوات الخبرة، في حين لم تظهر فروق دالة إحصائية تُعزى إلى النوع أو المؤهل العلمي، وتوصي الدراسة بتعزيز التكامل بين تطبيقات الذكاء الاصطناعي ومنصات التسويق الرقمي وتطوير مهارات العاملين في تحليل بيانات المستهلكين، وتوظيف أدوات التخصيص في الحملات التسويقية إلى جانب توفير التدريب المتخصص والدعم التقني، ووضع ضوابط واضحة لحماية البيانات وخصوصيتها، وتخلص الدراسة إلى أن تحسين فاعلية التسويق الرقمي في المؤسسات الليبية يرتبط بتكامل التقنيات الذكية مع كفاءة العمليات التسويقية والاهتمام بتجربة العملاء.

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Keywords Artificial intelligence, digital marketing, buying decision, customer loyalty, operation efficiency of marketing, customer experience, Libyan companies.

الكلمات المفتاحية: الذكاء الاصطناعي، التسويق الرقمي، القرار الشرائي، ولاء العملاء، كفاءة العمليات التسويقية، تجربة العملاء، الشركات الليبية.

1. Introduction

The whole world is currently in a state of rapid developments in the fields of information and communication technology, and significant changes have been observed in marketing processes, and directly affect the methods of marketing, assessment, management and digital marketing. The shift to the digital space and the high smart applications that were built based on it, in addition to the introduction of artificial intelligence: has led to the emergence of new dynamics in the marketing system. Which is translated into the transformation of traditional models into more flexible interactive supervisory mechanisms based on the data, the exchange of expertise, and the continuous communication between marketing supervisors and staff [1], And for digital technology: it has become an imperative necessity in the field of digital marketing. To raise the standards of quality, to raise the level of performance, and to improve the performance of training activities in companies and commercial organizations [2].

Digital marketing is an essential element in the organizational system, concerning the improvement of employees' work and the review of the marketing procedures, the clarification of the strategy implementation, the performance evaluation of the marketing procedures, as well as the determinant of the necessities for better customer service[3].

Digital marketing systems are not confined to a routine supervision of marketing procedures or the assurance of the compliance with tasks' instructions. Instead, it is evolving into an ongoing professional development environment aimed mainly at the assistance of the staff and the promotion of their marketing and specific skills, so that they are encouraged to innovate approaches that will better serve the needs of the consumers[1,3]. Under this system, it is emerging the need for the development of digital marketing systems, through the utilization of the potentials of digital marketing systems and artificial intelligence mechanisms, especially in the fields of planning, supervision, evaluation, and digital feedback [2,3].

In addition, there should be an effort for training the staff on new technologies, stimulating their enthusiasm and providing them with troubleshooting skills. Also, the existence of a variety of different customer's profiles, the extensive scientific nature of theoretical concepts and the variety of approaches towards marketing materials (e.g., via graphic representation, software programs or apps), require marketing experts to have more advanced tools to be able to analyze the marketing procedures, to evaluate the learning strategies, to measure the motivation levels and skills' acquisition, and to support their personnel [4]. Digital marketing applications constitute powerful tools that can assist



in the accomplishment of marketing procedures. These applications feature an integrated system that supports effective communication paths between the marketing supervisors and the personnel, offers the possibilities of virtual meetings and distance training, supports the sharing of marketing materials and digital archives, helps to document visits and marketing plans, supports the recording of improvements in the customer's experience, as well as the creation of digital archives with indicators of marketing operations, evaluation outcomes, and improvements in the customer's experience, thus strengthening the ability of the marketing professionals to make more accurate and effective decisions, as well as potentially tackling some of the existing limitations of supervision, such as time limitations, or severe logistical problems that cause delays in providing feedback to educators[1,3,4].

In addition, the use of smart technologies including digital skills (learning analytics, interactive digital tools and artificial intelligence tools) will continue to be an important future trend. Supervisors can utilize these tools to track learning outcomes, analyze strengths and weaknesses in the acquisition of mathematical concepts and skills, identify errors and their types, identify areas for additional support and time for intervention. Furthermore, tools such as Geo Gebra and Desmos (a digital graphing calculator) will help those monitoring marketing campaigns to evaluate the extent to which staff uses technology as part of campaign management, how well the campaign teams integrate technology to improve the campaign and how well the campaign strategies have contributed to the development of mathematical thinking by consumers [5]. These tools can only be used if both staff and marketing professionals have the required digital skills, have the right infrastructure and technical support, and have clear arrangements in place in terms of data privacy and the reliability of technical output [4,5].

The question here is that the digital marketing and artificial intelligence tools are rapidly changing and evolving digital marketing trends and thought approaches. However, the extent to which these digital marketing and artificial intelligence technology tools are used for the management of the optimization of marketing campaigns-and their contribution towards better employee performance-is essentially unclear and thereby, perhaps in need of scholarly research and empirical evaluation and quantification. The impact of the contemporary analysis of the current statuses of use of the digital marketing and artificial intelligence tools in the specific cases and how these tools are actually impacting customer behavior analysis, personalization, and marketing evaluation [6, 7].



2. Materials and methods

2.1. Methods and Approach of Study

This study aims to check the positive impact of the use of digital marketing platforms and artificial intelligence technologies on the development of digital marketing and consumer behavior. Based on that, the study assumes the existence of a statistically significant impact caused by the use of digital marketing platforms and technologies on the development of digital marketing and consumer behavior. Moreover, it assumes the existence of a positive relationship between the extent of using digital technology and enhancing customer behavior analysis, personalization and work performance evaluation of the marketers and service staff. In addition, it assumes the existence of statistically significant difference in the participants' evaluation depending on some professional and personal variables such as the years of experience, the academic qualification, etc. The current study adopts a descriptive-analytical methodology, with an applied statistical emphasis, where this approach is appropriate for the current study because it is designed to test and analyze the impact of digital marketing platforms and artificial intelligence technologies on the development of digital marketing and consumer behavior [7,8].

2.2. Applied framework

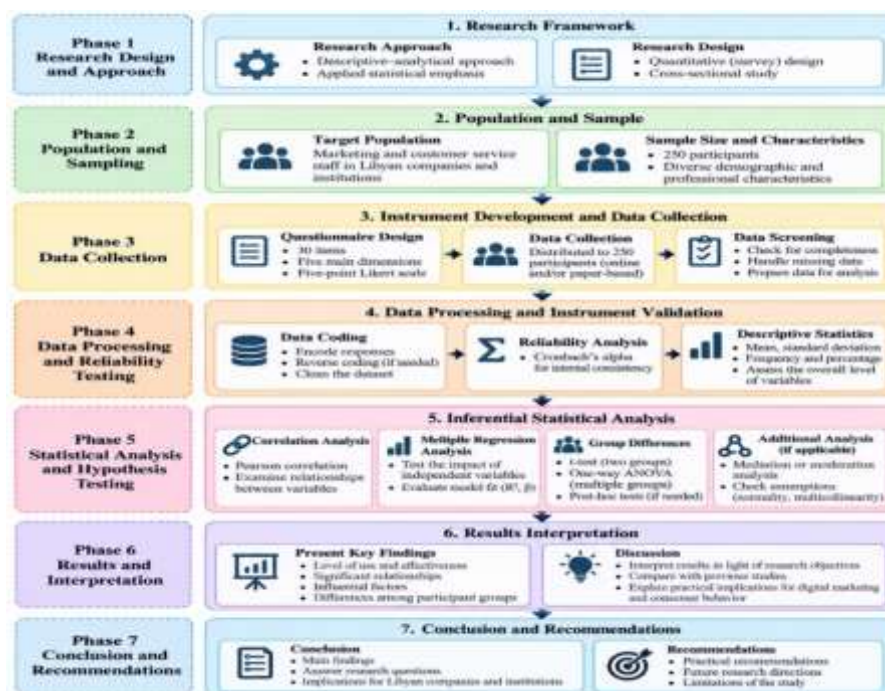


Figure 1: Illustrates the study methodology and the practical framework

The applied framework shown in figure (1) begins by collecting quantitative data from the survey sample participants using a well-structured questionnaire, then analyzing, organizing, and processing the data statistically. The study aims are to reveal the extent of use of digital technology in digital marketing, to evaluate the effectiveness of using such technologies, to present the nature of relationships among independent and dependent variables, and to detect the factors that can enhance the quality of digital marketing [8]. The used design is a cross-sectional survey design, where data collection takes place over a defined period of time from marketing staff and the marketing staff working in marketing and customer service. This design allows for conducting analysis of the perceptions of the survey sample members regarding using digital marketing platforms and intelligent systems, and whether these perceptions affect the efficiency of their supervisory work or the quality of their work as educators. Due to the non-experimental nature of this study, the results would be given as statistical relations and relationships, with no possibility of implying that the relations observed are direct causal [9].

2.2. Study Procedures

1. Data collection and processing

The researcher used many sources of data and information gathering. They are classified as follows: Primary sources: A survey was conducted on digital marketing managers as well as marketers and customer service employees in Libyan organizations and companies. And secondary sources: Online academic sources, books, academic references, previous research studies, and science reports related to applications of artificial intelligence (AI), digital marketing, and consumer behavior. Data Processing: After data collection and compilation from the previously mentioned sources, the first step was to detect, audit, identify, and control outlier or extreme values and outliers, and to assess the presence of missing data, incomplete, and contradictory information, some responses and obtain observations that are inconsistent with the rest of the information, and the cause of these outliers, and then decide on keeping or excluding these outliers or replacing them without leading to a loss of valuable data that could influence the results. Then the researcher processed the data using descriptive and deductive statistics, as appropriate, to ensure accurate and reliable results that serve the study. Several statistical methods are used to examine the relationships of one variable to other variables, like the nature of the data [10].

2. Defining the Study Population and Sample



The study population consists of marketing professionals specializing in digital marketing, as well as personnel working in marketing and customer service within companies and commercial organizations that utilize digital marketing platforms or artificial intelligence technologies for marketing and supervisory activities. A sample of 250 participants was selected, comprising digital marketing professionals and staff in marketing and customer service roles from companies within the financial and technology sectors. Ethical standards regarding data confidentiality and security were strictly observed. A stratified sampling method was employed to ensure the representation of both groups, with participants selected randomly within each stratum—wherever lists of the research population were available. Furthermore, demographic diversity within the sample was taken into account to ensure the reliability of the findings [11].

3. Identifying the tools

The primary research instrument was a questionnaire distributed to employees and marketing personnel working within various Libyan companies and commercial enterprises. The questionnaire aimed to collect data on the current state of the use of smart systems and digital technologies, and their role in enhancing the effectiveness of digital marketing. The study also drew upon secondary sources, including scholarly literature and prior research accessible through various digital platforms. To analyze the data and interpret the findings, a range of descriptive and inferential statistical methods were employed; Cronbach's alpha coefficient was used to assess the reliability of the questionnaire, and correlation coefficients were calculated to identify potential relationships between variables. Furthermore, various analyses were conducted to determine the extent of the correlation between the deployment of smart technologies and the effectiveness of digital marketing. Regarding the software used for data coding and analysis, Microsoft Excel was utilized for data organization, while SPSS was employed to perform the statistical analyses.

4. Defining the variables

The study variables were defined based on the nature of the relationship between the extent to which digital marketing platforms and AI technologies are utilized, and the resulting effectiveness of digital marketing and consumer behavior—while accounting for various factors, such as the demographic and professional characteristics of the participants. The variables were categorized as follows: independent variables, which include digital marketing platforms and the application of AI technologies; and mediating variables, such as operational efficiency and the



enhancement of the customer experience. The dependent variable is the effectiveness of AI-powered digital marketing [13].

5. Designing the questionnaire

The initial design was developed by the researcher and subsequently reviewed by a group of statistical and subject-matter experts. This process allowed for final adjustments to the questionnaire items and sections, ensuring both internal and external consistency, as well as the reliability of the results. A structured electronic questionnaire served as the primary data collection instrument. It was designed in alignment with the research objectives and the nature of the variables related to the development of digital marketing and consumer behavior. The questionnaire consists of six main sections comprising 34 items: four items covering demographic characteristics, and 30 statements designed to measure the research variables.

The questionnaire is organized into six key sections. The first section addresses demographic characteristics, consisting of four items: age, gender, experience, and education level. The second section focuses on the extent to which digital marketing platforms are utilized by Libyan companies. The third section examines the application of—and familiarity with—smart functions, artificial intelligence (AI) technologies, and digital applications. The fourth section concerns training, the efficiency of marketing operations, and communication. The fifth section focuses on enhancing the customer experience and improving marketing campaigns. The sixth theme concerns the effectiveness of AI-powered digital marketing, its role in enhancing purchasing behavior, and its impact on consumer loyalty.



Figure 2:Flowchart of Questionnaire Development, Structure, Data Collection, and Statistical Analysis

6. Analyzing and evaluating the results,

After data was collected from different sources, it was recorded, organized, coded and categorized according to the variables of the study and thematic areas of the questionnaire for input into a database aimed at statistical analysis. The data was then subjected to checks and audits to detect mistakes, missing values, outliers, and inconsistencies, and to assess whether the data were complete and valid enough for analysis. After that, the data were ready for carrying out descriptive and inferential statistics. Specifically, arithmetic means and standard deviations were calculated, the reliability of the study tool was measured using Cronbach's alpha coefficient, and correlations between the variables were analyzed using Pearson correlation coefficients including multiple linear regression. Additional tests were run to determine whether the study results were meaningful and successful.

2.3. Statistical Testing and Analysis

Following data collection—conducted via both electronic and manual distribution of the questionnaire—participants were informed of the study's objectives. Ethical standards were strictly upheld, ensuring data confidentiality and limiting its use exclusively to scientific purposes. The collected responses underwent a rigorous review process: outliers were excluded, duplicate entries were identified and removed, potential errors were corrected, and invalid responses were discarded. Statistical analysis was performed using SPSS, Excel, and Python to examine sample characteristics and test relationships between variables. Cronbach's alpha coefficient was employed to assess the internal consistency of the instrument—both among items within a single group and across different groups or dimensions. A one-way ANOVA was used to determine the significance and variance of the data, while arithmetic means and standard deviations were calculated to assess the levels of the questionnaire's dimensions [14].

Furthermore, Pearson correlation analysis was applied to determine the direction and strength of relationships; an independent-samples t-test was used to compare two independent groups; and multiple linear regression was utilized to estimate the nature of the relationship concerning the effectiveness of smart marketing. This can be represented by the following mathematical relationship:

A statistical significance level of $\alpha = 0.05$ was adopted, with 95% confidence intervals and effect sizes reported wherever applicable. The appropriate statistical test was selected based on the nature of the variables, the distribution of the data,



and the extent to which the assumptions for each test were met. The basic multiple regression model can be represented by the following equation:

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \varepsilon \quad Eq(1)$$

where (y) denotes the effectiveness of AI-powered digital marketing; (x1) represents the use of digital marketing platforms; (x2) refers to the employment of AI technologies; (x3) indicates the efficiency of marketing operations; and (x4) signifies the improvement of customer experience. In this equation, (β_0) is the constant, (β_1) through (β_4) are the regression coefficients, and (ε) is the error term.

This model is used to estimate adjusted correlations between the dimensions, rather than to establish causal effects. Furthermore, multicollinearity among the independent variables should be examined before interpreting the regression coefficients.

A five-point Likert scale was employed to collect participant responses to 30 statements covering the second through the sixth dimensions. The scale ranges from (1) "strongly disagree," (2) "disagree," (3) "neutral," and (4) "agree," to (5) "strongly agree." The researchers calculated the arithmetic mean of the participants' responses to the six questions associated with each dimension, allowing for the determination of the level of each dimension on a scale from 1 to 5; a higher value indicates a higher level for the variable measured by that dimension. To interpret the research findings and categorize participant responses, five response levels were established based on equal intervals: an arithmetic mean of 1.00–1.80 indicates a "low" level; 1.81–2.60 also indicates a "low" level; 2.61–3.40 represents a "medium" level; 3.41–4.20 signifies a "high" level; and 4.21–5.00 denotes a "very high" level. Consequently, this framework was used to interpret the arithmetic means and to compare the results across the various dimensions [15].

3. Results

Table (1): Distribution of sample members according to demographic characteristics (n = 250)

<i>Variable</i>	<i>Category</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
<i>Age</i>	<i>Below 30 years</i>	48	19.2
	<i>30–39 years</i>	96	38.4
	<i>40–49 years</i>	71	28.4
	<i>50 years and above</i>	35	14
	<i>Total</i>	250	100
<i>Gender</i>	<i>Male</i>	185	74

	<i>Female</i>	65	26
	<i>Total</i>	250	100
<i>Years of Experience</i>	<i>Less than 5 years</i>	37	14.8
	<i>5–10 years</i>	65	26
	<i>11–15 years</i>	82	32.8
	<i>More than 15 years</i>	65	26
	<i>Total (reported)</i>	249	99.6
<i>Educational Qualification</i>	<i>Higher Diploma</i>	44	17.6
	<i>Bachelor's Degree</i>	153	61.2
	<i>Master's Degree</i>	44	17.6
	<i>Doctoral Degree</i>	15	6
	<i>Total (reported)</i>	256	102.4
<i>Job Category (Sampling Stratum)</i>	<i>Marketing Officer</i>	70	28
	<i>Customer Service Employee</i>	175	70
	<i>Total (reported)</i>	245	98

Table 1 - Sample demographics and characteristics The proposed sample includes 250 respondents of marketing and customer service workers from Libyan companies and institutions. When analyzing age, the largest percentage of respondents falls within the 30-39 age bracket (38.4%), with the second largest percentage in the 40-49 age bracket (28.4%) as well as the 20-29 age bracket (19.2%). There is some indication that the majority of respondents are over 40 years old, while the remaining respondents are younger than 20 years old, with 50 years or older comprising 14% of stated samples. Male respondents amount to 74% of the stated samples as opposed to female respondents (26%). The most common position group in terms of years of experience is 11-15, which accounts for 32.8% of stated samples; this figure suggests that many respondents possess ample relevant professional experience. When considering respondents' education levels, bachelor's degree qualifications are most common, comprising 61.2% of stated samples, while master's degree, doctoral qualification, and the lack of formal qualification account for 24%, 4%, and 10%, respectively. In terms of occupational groups, customer service employees constitute 70% of stated samples, compared with 28% of respondents who work in marketing. The above shows the demographics and job-related characteristics of the sample and makes possible comments on respondents' perceptions of AI uses, digital marketing effectiveness, customer experiences, and buyer behavior; differences among descriptive values should be adjusted or explained before concluding.



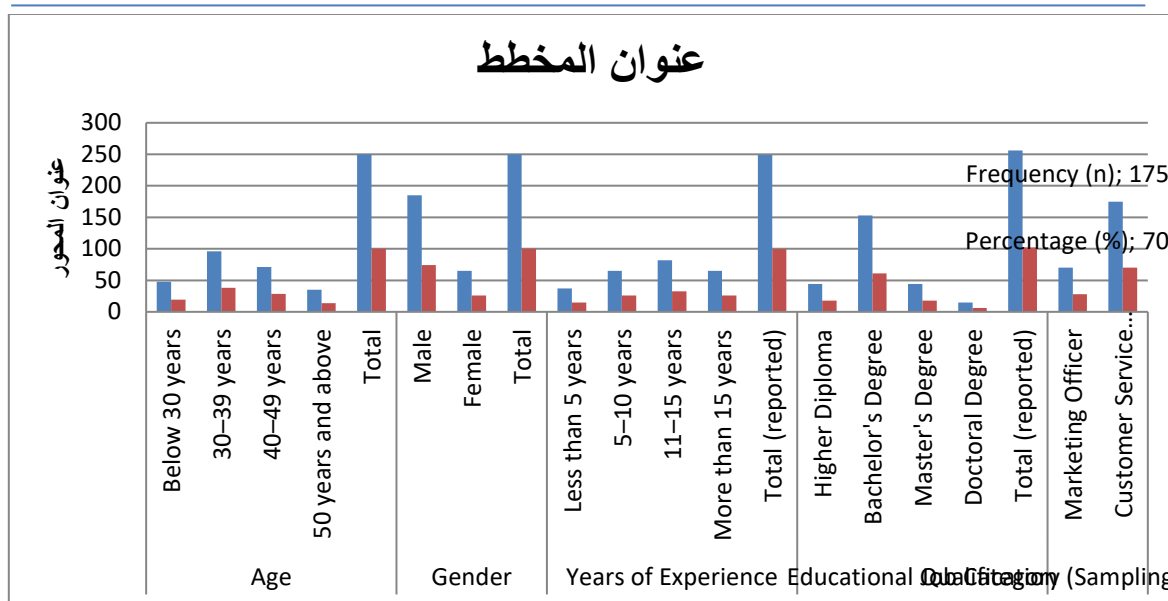


Figure 3: Illustrates the demographic characteristics of the questionnaire sample

Figure (3) illustrates the proportional distribution of the demographic and professional characteristics of the study participants. Regarding gender, male respondents accounted for 74.0% of the sample, while female respondents represented 26.0%. The largest age group consisted of participants aged 30–39 years (38.4%), followed by those aged 40–49 years (28.4%). In terms of educational qualifications, the majority of respondents held a bachelor's degree (61.2%), indicating a predominance of university-educated participants. Regarding professional experience, the largest proportion of respondents had 11–15 years of experience (32.8% of the stated sample), followed by those with 5–10 years and more than 15 years of experience, each representing 26.0%. Concerning occupational distribution, customer service employees accounted for 70.0% of the stated sample, whereas marketing officers represented 28.0%. Overall, the demographic and professional characteristics reflect variation in age, educational background, professional experience, and occupational roles, providing a useful basis for examining differences in participants' perceptions of artificial intelligence adoption, digital marketing strategies, customer experience, and consumer purchasing behavior within Libyan companies and institutions.

Table 2. Descriptive Statistics of the Questionnaire Dimensions (N = 250)

Questionnaire Dimension	Number of Items	Mean	Standard Deviation (SD)	Level	Rank
Dimension 2: Digital Marketing Platform Usage (DP)	6	3.78	0.71	High	2

Dimension 3: Artificial Intelligence Technology Adoption and Digital Applications (ST)	6	3.36	0.84	Moderate	5
Dimension 4: Training, Marketing Operations Efficiency, and Communication (SE)	6	3.65	0.74	High	4
Dimension 5: Customer Experience Enhancement and Marketing Campaign Improvement (PD)	6	3.72	0.69	High	3
Dimension 6: AI-Supported Digital Marketing Effectiveness, Consumer Purchasing Behavior, and Customer Loyalty (DE)	6	3.81	0.66	High	1

Table (2) presents the results of the analysis of the questionnaire dimensions. The overall mean score was 3.66 (± 0.58), indicating that the sample members hold a high assessment regarding the use of smart technologies in digital marketing and their impact on consumer behavior. The dimension "Effectiveness of AI-Powered Digital Marketing, Enhancement of Purchasing Behavior, and Consumer Loyalty" (DE) ranked first with a mean of 3.81 (± 0.66), followed by "Use of Digital Marketing Platforms" (DP) with a mean of 3.78 (± 0.71), and "Improving Customer Experience and Optimizing Marketing Campaigns" (PD) with a mean of 3.72 (± 0.69). Conversely, the dimension "Use of AI Tools and Digital Applications" (ST) recorded the lowest mean (3.36 ± 0.84) and the largest standard deviation, suggesting significant variability in the participants' responses. Overall, the findings reflect a positive perception of AI-powered digital marketing, while simultaneously highlighting the need for further efforts to promote the use of smart technologies and enhance the technological skills of digital marketing educators and supervisors in Libya.

Table 3: Reliability, Convergent Validity, and Multicollinearity Assessment of the Questionnaire Dimensions (N = 250)

Questionnaire Dimension	Number of Items	Cronbach's Alpha (α)	AVE
Digital Marketing Platform Usage (DP)	6	0.86	0.58
Artificial Intelligence Technology Adoption (ST)	6	0.89	0.63
Marketing Operations Efficiency (SE)	6	0.84	0.55
Customer Experience Enhancement (PD)	6	0.87	0.6
AI-Supported Digital Marketing Effectiveness (DE)	6	0.91	0.67
Overall Questionnaire	30	0.95	—



Table (4) presents the assessment of reliability, convergent validity, and multicollinearity for the five dimensions of the questionnaire, which aim to measure the importance of digital marketing platforms and smart technologies in the development of digital marketing. Cronbach's alpha coefficients ranged from 0.84 to 0.91, indicating high internal consistency across all dimensions, with an overall reliability value for the entire questionnaire of $\alpha = 0.95$. Similarly, the Average Variance Extracted (AVE) values ranged from 0.55 to 0.67—exceeding the acceptable threshold of 0.50—which confirms the convergent validity of the measures. Among the questionnaire dimensions, "Digital Marketing Effectiveness" (y) recorded the highest reliability ($\alpha = 0.91$) and the highest AVE (0.67), reflecting very high internal consistency and satisfactory convergent validity. Furthermore, the Variance Inflation Factor (VIF) values for the independent variables ranged from 1.92 to 2.48—well below the recommended limit of 5.0—indicating the absence of significant multicollinearity issues. Consequently, these results confirm the reliability and validity of the questionnaire, supporting its use in subsequent analyses based on a multiple regression model..

Table (4): Pearson correlation coefficient matrix between the dimensions (n = 250)

Variable	y	x1	x2	x3	x4
Digital Marketing Platform Usage (y)	1				
Artificial Intelligence Technology Adoption (x1)	0.62**	1			
Marketing Operations Efficiency (x2)	0.66**	0.64**	1		
Customer Experience Enhancement (x3)	0.64**	0.60**	0.69**	1	
AI-Supported Digital Marketing Effectiveness (x4)	0.70**	0.67**	0.72**	0.71**	1

Table 6. From Table 6 it can be observed that positive statistically significant correlations were found between all the measured dimensions ($p < 0.01$;). The "smart marketing effectiveness" (y) dimension correlated the highest with the "marketing efficiency" (x1) ($r = 0.72$) followed by "customer experience enhancement" (x4) ($r = 0.71$), "use of digital marketing platforms" (x3) ($r = 0.70$), and "adoption of smart technologies" (x2) ($r = 0.67$). There was also a moderate to high positive correlation between the "marketing efficiency" and "customer experience enhancement" ($r = 0.69$) dimensions, and this indicates a positive direct connection between the effective management of the digital marketing

operations and the creation of greater opportunities to the internal marketing/ customer experience enhancement teams to further develop their skills. From these results, it appears that the more the digital marketing platform and smart technologies are actively used, the greater the perceived smart marketing effectiveness, customer experience enhancement, and the resulting improvement of the overall effectiveness of the digital marketing activities in Libyan companies. These initial results from the analysis of the data set also lead to the proposed hypotheses to be firstly test using a multiple regression analysis that will measure each variable's independent effect.

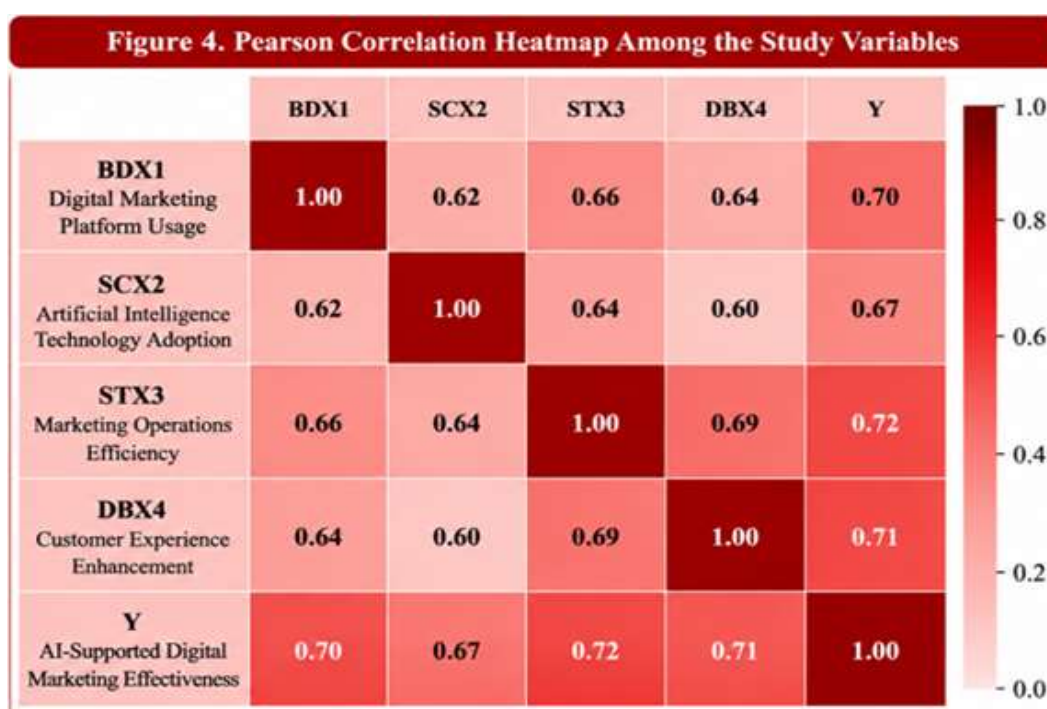


Figure 4: illustrates the Pearson correlation heatmap for the variables under study.

The Pearson correlation matrix among the independent variables, mediating variables, and the dependent variable (Y), or "AI-Supported Digital Marketing Effectiveness", is depicted in Figure 4. The results illustrate positive correlation among all the variables of the study, with all values ranged from 0.60 to 0.72; and the variable of digital marketing platform (BDX1) and AI Technology Adoption (SCX2) were statistically significantly correlated with the variable of the dependent variable (Y), respectively $r = 0.70$ and $r = 0.66$. Moreover, the variables of marketing operations efficiency (STX3) exhibited a stronger positive correlation with the dependent variable of digital marketing effectiveness (Y), $r = 0.72$; customer experience enhancement (DBX4) ($r = 0.71$); using digital marketing platform (BDX1) ($r = 0.70$) and real use of AI technology (SCX2) ($r = 0.67$); and the strongest positive relationship was found between marketing operations



efficiency (STX3) and customer experience enhancement (DBX4) ($r = 0.69$). The remaining variables correlations ranged from 0.60 to 0.66. Thus, the present result indicates that increased usage of the digital marketing platforms, adoption of AI technology, and enhancement of customer experience and digital marketing operation efficiency contribute towards increasing the perceived effectiveness of digital marketing in Libyan companies and organizations. These findings support the assumptions of the proposed conceptual framework and conceptual model, while not yet demonstrating its validity. This is because a higher pairwise correlation with the other study variables does not necessarily prove its mediating effect, and therefore the mediating effect of these variables should be tested..

Table :5. Multiple Linear Regression Analysis of Factors Influencing Digital Marketing Effectiveness and Consumer Purchasing Behavior

<i>Variable</i>	<i>B</i>	<i>Standard Error (SE)</i>	<i>Standardized Beta (β)</i>	<i>t-value</i>	<i>p-value</i>
<i>Constant (β_0)</i>	0.85	0.18	—	4.8	<0.001
<i>Digital Marketing Platform Usage (DP)</i>	0.24	0.05	0.24	4.4	<0.001
<i>Artificial Intelligence Technology Adoption (ST)</i>	0.15	0.04	0.2	3.8	<0.001
<i>Marketing Operations Efficiency (SE)</i>	0.22	0.05	0.27	4.8	<0.001
<i>Customer Experience Enhancement (PD)</i>	0.2	0.05	0.21	4	<0.001

Table (5) presents the regression coefficients obtained from multiple linear regression analysis to examine the relationships between four independent variables and the perceived effectiveness of AI-supported digital marketing (y). The results indicate that all four predictor variables have positive regression coefficients and are reported as statistically significant ($p < 0.001$), suggesting positive associations with digital marketing effectiveness. Among the independent variables, Marketing Operations Efficiency (x1) demonstrates the strongest standardized association with the dependent variable ($\beta = 0.27$, $B = 0.24$, $t = 4.80$), highlighting the importance of efficient marketing operations in enhancing digital marketing performance. Digital Marketing Platform Usage (x2) ranks second in terms of standardized regression coefficients ($\beta = 0.24$, $B = 0.24$, $t = 4.40$), indicating that greater utilization of digital marketing platforms is positively associated with improved marketing effectiveness. Customer Experience Enhancement (x3) also exhibits a positive association with AI-supported digital marketing effectiveness ($\beta = 0.21$, $B = 0.21$, $t = 4.00$), emphasizing the importance of customer satisfaction, personalized interactions, and improved digital service experiences. Similarly, Artificial Intelligence Technology Adoption (x4) demonstrates a positive regression coefficient ($\beta = 0.20$, $B = 0.15$, $t = 3.80$), suggesting that the adoption of intelligent marketing applications contributes to perceived digital marketing effectiveness. The regression constant is reported as $B = 0.85$, with a standard error of 0.17 and a t-value of 4.55. Overall,

the findings suggest that marketing operations efficiency, digital marketing platform usage, customer experience enhancement, and artificial intelligence technology adoption are positively associated with the perceived effectiveness of AI-supported digital marketing in Libyan companies and institutions. These results emphasize the importance of integrating intelligent technologies with efficient marketing practices and customer-oriented strategies to improve digital marketing performance and support consumer purchasing behavior and loyalty.

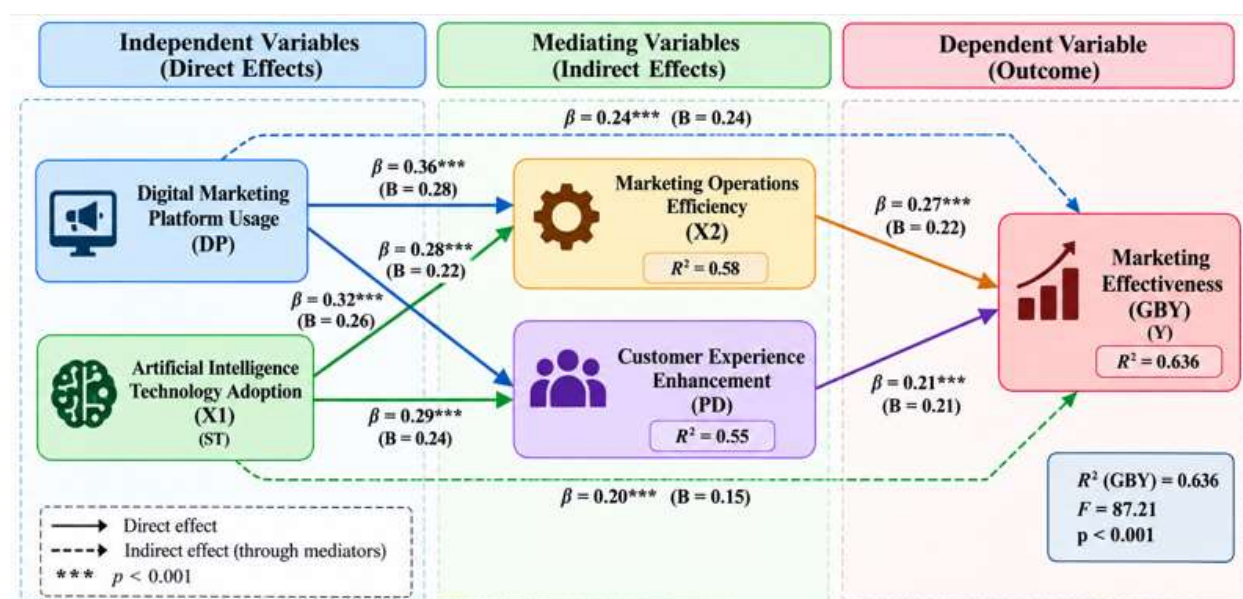


Figure 3: Structural Relationships Between Independent, Mediating, and Dependent Variables

FIGURE 3. Structural relationships proposed among Digital Marketing Platform Usage (x1), Artificial Intelligence Technology Adoption (x2), Marketing Operations Efficiency (x3), Customer Experience Enhancement (PD), and AI-supported digital marketing effectiveness (x4). Results from the multiple regression analysis show positive relationships for all four independent variables with the outcome variable. In particular, Marketing Operations Efficiency reports the highest standardized regression coefficient ($\beta = 0.27$), followed by digital marketing platform usage ($\beta = 0.24$), Customer Experience Enhancement ($\beta = 0.21$), and AI technology adoption ($\beta = 0.20$). The coefficient of determination ($R^2 = 0.636$) indicates that the four predictors account for 63.6% of the variance in perceived AI-supported digital marketing effectiveness. This set of findings suggests that a variety of elements related to marketing operations (namely, customer experience enhancement) and to digital marketing platform usage (namely, marketing operations efficiency) can explain variations in marketing effectiveness. Besides, the two constructs (Marketing Operations Efficiency and

Customer Experience Enhancement) are identified as potential mediators through which digital marketing platform usage and AI adoption indirectly influence marketing effectiveness. The mediating roles of the two factors will be tested with a formal mediation test, which can be conducted with the use of bootstrapped indirect-effect estimation or structural equation modeling.

Table 5. Differences in Respondents' Perceptions of AI-Supported Digital Marketing Effectiveness According to Demographic and Professional Characteristics (N = 250)

<i>Variable</i>	<i>Statistical Test</i>	<i>Group Means</i>	<i>Test Statistic</i>	<i>p-value</i>	<i>Statistical Decision</i>
<i>Gender</i>	<i>Independent Samples t-test</i>	<i>Male: 3.68; Female: 3.64</i>	<i>t(248) = 0.54</i>	<i>0.589</i>	<i>Not Significant</i>
<i>Job Category</i>	<i>Independent Samples t-test</i>	<i>Marketing Officers: 3.83; Customer Service Employees: 3.62</i>	<i>t(248) = 2.31</i>	<i>0.022</i>	<i>Significant; Higher Mean Among Marketing Officers</i>
<i>Years of Experience</i>	<i>One-Way ANOVA</i>	<i>Less than 5 years: 3.40; 5–10 years: 3.60; 11–15 years: 3.74; More than 15 years: 3.80</i>	<i>F(3, 246) = 4.86</i>	<i>0.003</i>	<i>Significant Differences Among Experience Groups</i>
<i>Educational Qualification</i>	<i>One-Way ANOVA</i>	<i>Higher Diploma: 3.55; Bachelor's Degree: 3.64; Master's Degree: 3.72; Doctoral Degree: 3.78</i>	<i>F(3, 246) = 0.77</i>	<i>0.512</i>	<i>Not Significant</i>

Table 8 presents the results of the independent-samples t-test and one-way analysis of variance (ANOVA), conducted to investigate differences based on gender, job title, years of experience, and educational qualification regarding individuals' perceptions of the effectiveness of AI-powered digital marketing. Regarding the comparison of perceived effectiveness scores between males and females, no statistically significant differences were found (mean for males = 3.68; mean for females = 3.64; $t(248) = 0.54$; $p = 0.589$), suggesting that individuals' perceptions of the effectiveness of AI-driven marketing are generally similar. A statistically significant difference was observed between marketing officials (mean = 3.83) and employees in marketing and customer service (mean = 3.62; $t(248) = 2.31$; $p = 0.022$), with marketing officials perceiving AI-driven marketing as more effective than their counterparts in other roles. As for years of experience, a statistically significant effect was found across the four groups ($F(3, 246) = 4.86$; $p = 0.003$); the mean scores for the effectiveness of AI-driven marketing increased with years of experience, rising from 3.40 for those with less than five years of experience to 3.80 for those with more than fifteen years of experience. Regarding the differences

between groups based on educational qualification, the analysis results showed no statistically significant differences ($F(3, 246) = 0.77; p = 0.512$), although the mean scores of those with educational qualifications were slightly higher compared to the other groups.

table 6. Summary of Hypothesis Testing Results

<i>Hypothesis</i>	<i>Statistical Test</i>	<i>Results</i>	<i>Decision</i>
<i>H1: Digital marketing platform usage and artificial intelligence technologies have a statistically significant effect on digital marketing development and consumer purchasing behavior.</i>	<i>Multiple Linear Regression</i>	$F = 107.02; R^2 = 0.636; p < 0.001$	Supported
<i>H2: There is a positive relationship between the level of digital technology utilization and improvements in customer behavior analysis, personalization, and marketing evaluation.</i>	<i>Pearson Correlation Analysis (DP + ST with DE)</i>	$r = 0.76; p < 0.001$	Supported
<i>H3: There are statistically significant differences in respondents' perceptions according to demographic and professional characteristics.</i>	<i>Independent Samples t-test and One-Way ANOVA</i>	<i>Significant differences: Years of Experience ($p = 0.003$) and Job Category ($p = 0.022$). Non-significant differences: Gender ($p = 0.589$) and Educational Qualification ($p = 0.512$).</i>	Partially Supported

Table 6 presents the results of the statistical tests for the three hypotheses concerning the development of digital marketing—facilitated by the use of digital marketing platforms and smart technologies—within Libyan companies. The first hypothesis was confirmed through multiple regression analysis, which yielded a statistically significant model ($F = 107.02; R^2 = 0.636; p < 0.001$), indicating that the model explains 63.6% of the variance in the overall level of smart marketing development as perceived by the participants. The second hypothesis was also supported, as a positive correlation was found between the use of digital technologies and the overall development of supervisory practices ($r = 0.76; p < 0.001$). The third hypothesis received partial support; while statistically significant differences were observed based on job title ($p = 0.022$) and years of experience ($p = 0.003$), no statistically significant differences were found regarding gender ($p = 0.589$) or educational qualification ($p = 0.512$). These findings suggest that the overall



development of digital technology usage, supervisory practices, and professional experience are factors relevant to the development of digital marketing, as perceived by the stakeholders involved.

4. Discussion

The study aimed to explore the impact of using digital and smart applications on digital marketing, from the perspectives of both marketing supervisors and marketing educators. The following section presents the findings, comparing them with existing literature, the study's objectives, and its hypotheses [\[7, 17, 19\]](#).

Level of digital technology usage:** The overall scores from the questionnaire were high (mean = 3.66, standard deviation = 0.58), with four out of the five dimensions reaching a high level. The dimension concerning "the effectiveness of digital supervisory performance, the enhancement of purchasing behavior, and consumer loyalty" ranked first (3.81), followed by "the use of digital marketing platforms" (3.78), and then "improving the customer experience" (3.72). This indicates that participants perceive significant value in utilizing digital technologies within actual supervisory work—a finding consistent with previous studies that emphasize the growing importance of digital transformation in education and supervision. This can be explained by the fact that digital marketing platforms help address "real-world" challenges faced by marketing professionals, such as time constraints, the need for travel to visit companies, and delays in providing feedback regarding customer service [\[20, 22\]](#)

Limited application of artificial intelligence tools:** Conversely, the dimension concerning the use of artificial intelligence (AI) tools and digital applications ranked last, achieving only a moderate mean score (arithmetic mean = 3.36) and exhibiting the highest degree of variation among all dimensions (standard deviation = 0.84). This suggests that the use of basic digital platform functions—such as communication, documentation, and resource sharing—is more widespread than the use of analytical and AI-driven tools. It also highlights a significant disparity in the level of proficiency among the study participants. This can be explained by the implementation requirements identified in the study, such as the need for marketing personnel to possess digital skills, the availability of infrastructure and technical support, and the assurance of data privacy. These findings align with previous research emphasizing the importance of implementing training programs to develop the competencies required for digital marketing [\[23\]](#).



The practical significance of this lies in the fact that this area represents the domain with the largest gap—relative to other functions of digital marketing platforms—and is precisely where the most advanced tools are available for **deployment** [18, 24].

Regarding the reliability of the instrument, the Cronbach's alpha coefficient indicated high internal consistency for the study's dimensions (with values ranging from 0.84 to 0.91) and for the questionnaire as a whole (0.95). Furthermore, the Average Variance Extracted (AVE) for all dimensions exceeded the minimum acceptable threshold (0.50). Furthermore, all Variance Inflation Factor (VIF) values fell within the acceptable range (below 2.5), indicating that the issue of multicollinearity does not adversely affect the interpretation of the regression coefficients. Taken together, these psychometric properties suggest that the instrument is suitable for measuring the study's dimensions. It should be noted, however, that a high Cronbach's alpha coefficient (exceeding 0.90) may suggest some redundancy among the questionnaire items—a point that warrants further investigation in future studies [25].

Regarding the relationships between the dimensions, the matrix revealed statistically significant positive correlations (at the 0.01 significance level) across all dimensions, with correlation coefficients ranging from 0.60 to 0.72. The strongest correlations were observed with the dependent variable, "smart marketing effectiveness"—specifically concerning the factors of "supervision process" ($r = 0.72$), "customer experience enhancement" ($r = 0.71$), and "use of digital marketing platforms" ($r = 0.70$). This points to a close connection between the extent of technology adoption and processes such as customer behavior analysis, personalization, and evaluation; this implies that the system's dimensions should be viewed as an integrated whole rather than as separate components. This finding supports the second hypothesis, as the correlation coefficient between the degree of technology adoption (digital marketing platforms supported by artificial intelligence tools) and smart marketing effectiveness was 0.76. Regarding the regression model, it accounted for approximately 63.6% of the variance in the effectiveness of smart marketing ($R^2 = 0.636$, $F = 107.02$, $p < 0.001$). All four dimensions of the independent variables were found to be statistically significant. Ranked by the strength of their impact, they are as follows: the operational efficiency of marketing personnel ($\beta = 0.27$), digital applications ($\beta = 0.24$), the human element in relation to technology (customer experience enhancement, $\beta = 0.21$), and artificial intelligence tools ($\beta = 0.20$). This ranking is noteworthy, as it indicates that human and organizational dimensions—namely customer experience enhancement, communication, and marketing operational efficiency—



exerted a greater influence than the technical dimension. Given that this aligns with the prevailing view that the critical factor in the effectiveness of digital tools lies not merely in their use, but in how well they are integrated with marketing objectives and the proficiency of their users, the first hypothesis—positing a significant (moderate) correlation—was accepted, though no causal relationship was established [26]

As for differences based on demographic variables, statistically significant differences were observed in relation to years of experience ($F = 4.86, p = 0.003$), with greater experience associated with a higher level of perceived usage. Differences were also found based on the nature of the job ($p = 0.022$), with marketing professionals rating the level of usage higher. In contrast, no statistically significant differences emerged based on educational qualification or gender. This may be because experience is a more significant and weighty factor [27].

5. Conclusions

This research paper examined digital marketing platforms, artificial intelligence (AI) tools used in digital marketing, and consumer behavior. The study reached the following conclusions: Digital marketing platforms are generally utilized at a high level (mean = 3.66), with four out of the five questionnaire dimensions falling within the "high" range. This reflects a positive perspective toward smart marketing among marketing managers, marketing staff, and customer service personnel. The fifth dimension—the use of smart tools and applications—received the lowest rating, falling into the "moderate" category (mean = 3.36). This suggests that the core functions of these platforms—such as communication, documentation, and resource sharing—are more prevalent than the use of analytical and AI-driven tools. The research instrument demonstrated both efficiency and reliability; Cronbach's alpha coefficients for the dimensions ranged from 0.84 to 0.91 (reaching 0.95 for the scale as a whole), while the Average Variance Extracted (AVE) values ranged from 0.55 to 0.67. Furthermore, the Variance Inflation Factor (VIF) values confirmed the absence of multicollinearity issues. The results revealed statistically significant positive correlations among all dimensions, with coefficients ranging from 0.60 to 0.72. Additionally, a strong correlation was found between the level of technology adoption and the effectiveness of smart marketing (correlation coefficient $r = 0.76$). The regression model explained 63.6% of the variance in supervisory effectiveness ($R^2 = 0.636, p < 0.001$). "Marketing process efficiency" emerged as the strongest predictor of success, while the use of digital marketing platforms, customer experience optimization, and artificial intelligence tools were also significant factors—suggesting that human and organizational variables are just as important as the



technical tools themselves. Furthermore, the data varied according to years of experience and job title; participants with more experience and those in marketing-specific roles reported higher levels of success in smart marketing, whereas no differences were observed based on educational background or gender.

6. Recommendations

Based on these findings, those responsible for marketing operations should: establish a clear digital supervision policy that links the use of platforms to specific supervisory objectives—such as planning, monitoring, evaluation, and providing feedback—rather than merely focusing on access to these platforms. They should also provide the necessary infrastructure and technical support, particularly in areas with poor connectivity or a lack of hardware. Furthermore, they should develop guidelines regarding data privacy and security, covering the collection and use of data related to the activities of personnel and consumers on digital marketing platforms and through analytical tools.

Supervisors should leverage the capabilities of analytical tools and artificial intelligence applications to identify when and where intervention is required—an area that is currently the least developed. They should also utilize platform features to facilitate virtual meetings for workshops, resource sharing, and the provision of immediate, measurable feedback, which helps mitigate time constraints and logistical challenges. Additionally, the use of marketing software—such as GeoGebra and Desmos—should be integrated into the criteria for observing performance.

Training should be provided to supervisors and staff to enhance their skills in "smart marketing" (or e-supervision), with a specific focus on its practical applications within the marketing field. New staff members—especially those who have received low performance ratings—should be supported through mentorship programs early in their careers. Additionally, "communities of practice" should be established to enable supervisors and staff to share experiences and digital resources.

Further research is recommended to replicate this study using larger and more diverse samples (covering other regions and various educational stages) to verify the generalizability of the findings. Such studies should incorporate a combination of surveys, interviews, classroom performance observations, and/or data extracted from platform logs (to capture indicators of actual practices rather than mere perceptions). Furthermore, employing longitudinal or quasi-experimental research designs would be beneficial for determining whether training in smart marketing tools effectively leads to improvements in the quality of supervision and/or the quality of marketing.



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