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Shaping customer insights through e-marketing: An applied study in the banking sector

Adel Ghonim, Abdelrehim Awad *

Department of Business Administration, College of Business, University of Bisha, Bisha 61922, Saudi Arabia

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ABSTRACT

This study examines how digital marketing tools—including websites, social media, email marketing, and mobile applications—affect customer understanding and engagement in public commercial banks in Egypt. A descriptive analytical approach was used, combining both quantitative and qualitative methods to explore how these digital strategies can improve customer satisfaction and loyalty. Data were collected through a structured survey of 600 participants, including 300 bank staff and 300 clients. The analysis involved multiple regression, correlation analysis, variance inflation factor (VIF) checks, and robustness testing to ensure the reliability of the findings. The results show that mobile applications have the strongest influence on customer engagement ($\beta = 0.78$, $p < 0.01$), followed by websites ($r = 0.72$, $p < 0.01$), social media marketing ($\beta = 0.65$, $p < 0.01$), and email marketing ($r = 0.54$, $p < 0.01$). The study also found generational differences in the use of digital tools: younger customers prefer mobile applications and social media, while older customers engage more with websites and email marketing. In addition, the research identifies key challenges in digital marketing, such as technological limitations, organizational resistance, and concerns about data privacy. It emphasizes the need for stronger cybersecurity measures and compliance with regulatory requirements. This study provides useful insights for banking professionals and decision-makers to improve digital marketing strategies and build long-term customer relationships. It also highlights the importance of using technology-based, customized marketing approaches to meet the changing needs of customers. Future research should explore the use of advanced technologies such as blockchain, augmented reality, and predictive AI analytics in banking marketing strategies. By adopting innovative and data-driven marketing methods, banks can enhance customer engagement and maintain a competitive position in the fast-changing digital financial environment.

1. Introduction

As we navigate through a time of swift technological progress, e-marketing has become a fundamental element in transforming the marketing environment, especially in the banking industry. The widespread impact of digital tools and platforms has transformed conventional marketing methods and allowed financial institutions to connect with their customers more efficiently. Utilizing e-marketing strategies allows banks to improve customer experience, foster stronger relationships, and achieve a competitive edge in a rapidly changing landscape (Kitsios et al., 2021).

The incorporation of cutting-edge technologies like Artificial Intelligence (AI), Blockchain, and Big Data analytics significantly boosts the effectiveness of e-marketing tools in the banking sector, leading to more tailored and efficient customer experiences. These technologies allow banks to foresee customer requirements and provide precisely tailored campaigns (Magableh et al., 2024).

The use of e-marketing tools, including websites, social media platforms, email campaigns, and mobile applications, has enabled banks to broaden their reach and tailor services to cater to various customer needs. These tools enhance immediate engagement, allowing banks to collect important information about customer behaviors and preferences. Insights powered by AI and machine learning algorithms play

* Corresponding Author.
Email Address: aawad@ub.edu.sa (A. Awad)
https://doi.org/10.21833/ijaas.2025.04.011
Corresponding author's ORCID profile:
https://orcid.org/0009-0005-3649-430X

a vital role in developing customized services, enhancing customer loyalty, and sustaining a competitive advantage in a swiftly evolving digital landscape.

Despite its growing significance, the application of e-marketing in the banking sector faces challenges, including varying levels of adoption, customer receptiveness, and the ability to balance digital and traditional approaches. These challenges are compounded by concerns around data privacy, security, and the digital literacy of some customer segments, especially in emerging markets like Egypt. In the context of the Egyptian banking sector, understanding how e-marketing tools contribute to customer engagement and satisfaction remains underexplored. This gap underscores the need for comprehensive research to examine the role and effectiveness of e-marketing in shaping customer perceptions and fostering loyalty.

This research seeks to explore how e-marketing impacts customer engagement in the banking industry. This research aims to delve into essential aspects of e-marketing, examining its influence on customer engagement strategies and investigating opportunities for improving delivery service. This study will offer a thorough analysis of the Egyptian banking sector, presenting practical insights and suggestions for utilizing e-marketing tools to adapt to changing customer expectations, improve satisfaction, and promote institutional growth, all while tackling the technological, regulatory, and organizational obstacles that impede their complete implementation.

2. Literature review

The significant impact of e-marketing in the banking sector has attracted considerable interest lately, especially regarding its potential to change customer interactions and enhance service delivery. Digital marketing instruments, such as websites, social media platforms, email, and mobile applications, have emerged as essential components in crafting tailored customer experiences and nurturing enduring relationships. These tools allow banks to improve their competitive edge in an environment that is swiftly evolving, marked by the global digital transformation of industries.

The incorporation of cutting-edge technologies such as Artificial Intelligence (AI), Blockchain, and Big Data analytics has significantly improved the effectiveness of e-marketing within the banking industry. These technologies enable financial institutions to deliver tailored services, anticipate client requirements, and enhance promotional approaches.

The shift from conventional to digital marketing platforms has been a fundamental aspect of the banking sector's development. Alzahmi (2020) emphasized that the adoption of e-marketing in Islamic banks within the UAE notably enhanced customer relationships and the quality of services provided. In a similar vein, Veleva and Tsvetanova (2020) highlighted the benefits of digital marketing, including an expanded customer base and improved efficiency, while also addressing challenges such as the need for technology adaptation and issues related to data privacy.

The incorporation of AI-powered marketing solutions has been crucial in tackling these issues by allowing banks to enhance their customer segmentation and engagement approaches. Yang et al. (2024) illustrated the capacity of AI-driven tools to provide banks with profound customer insights, enhance segmentation strategies, and facilitate predictive modeling. These technologies enable banks to develop customized marketing approaches, enhancing customer satisfaction and loyalty (Plangger et al., 2023). The swift evolution of artificial intelligence (AI) is reshaping the e-commerce environment, encouraging companies to embrace creative marketing approaches. This research explores the connection between AI applications and marketing innovation within Egyptian e-commerce retailers, emphasizing the mediating influence of organizational culture. The results indicate a noteworthy positive relationship between AI applications and marketing innovation, with organizational culture serving as an essential mediating factor. The research indicates that incorporating AI into marketing approaches can significantly boost innovation, especially when paired with a nurturing organizational environment (Awad, 2024).

In a similar vein, Tiago and Veríssimo (2014) emphasized the effectiveness of websites as a crucial element of e-marketing strategies. These platforms act as central points for both transactional and informational functions, enabling banks to enhance their customer service processes and broaden their geographic reach. Furthermore, the impact of social media platforms on improving customer engagement has been thoroughly recorded. Wang and Yu (2017) highlighted that email marketing remains a cost-effective and targeted tool for communicating with customers, while Jain and Jain (2022) emphasized the increasing reliance on mobile applications as channels for delivering personalized services. The significance of electronic marketing in the management of customer knowledge has gained considerable attention within the banking industry. Albarq (2023) highlighted that customer knowledge management (CKM) plays a crucial role in the banking sector by enhancing processes related to collecting, organizing, and sharing customer-related information. His research in the Saudi banking context revealed a favorable relationship between CKM practices and customer loyalty, particularly through the mediating effect of customer trust. However, the study also emphasized that the implementation of CKM in Saudi banks is still evolving, especially concerning the integration of customer insights into strategic decision-making frameworks.

The adoption of e-marketing in banking is significantly influenced by a focus on customer needs and advancements in technology. The Technology Acceptance Model (TAM) has been extensively applied to investigate consumer behavior regarding new technologies in the realm of e-marketing. Ezzi (2014) and Zhang et al. (2018) identified that factors such as perceived usefulness, ease of use, and trust play a significant role in the adoption of online and mobile banking. Furthermore, the influence of cultural and religious elements is significant, especially within Islamic banking, as adherence to Sharia principles contributes to increased customer satisfaction and trust (Usman et al., 2021).

Challenges such as perceived risk and limited knowledge continue to pose significant obstacles to adoption. Ansari (2018) highlighted that overcoming these obstacles via education and transparency can enhance the uptake of e-banking services in developing nations. Enhancing educational initiatives and refining customer support frameworks are crucial for addressing these challenges, particularly in developing markets such as Egypt.

Social media has become a significant digital marketing instrument for connecting with customers and fostering brand loyalty. Yadav and Rahman (2018) highlighted the importance of interactivity, informativeness, and personalization as essential elements in successful social media marketing. Puspaningrum (2020) and Ebrahim (2020) highlighted the significance of trust in influencing the connection between social media marketing efforts and brand loyalty within the banking sector. The findings highlight the necessity of developing captivating and reliable content to nurture enduring connections with customers.

The growing dependence on social media marketing in the banking sector has prompted a transformation in the ways financial institutions interact with their customers. In contrast to conventional marketing approaches that emphasize broad communication, social media marketing facilitates immediate interactions, promoting a lively exchange of information in both directions. This transformation not only improves the management of customer relationships but also allows banks to collect important insights about their customers through metrics related to engagement, analysis of sentiment, and monitoring of behavior. Nonetheless, the success of SMM relies heavily on the adoption of rigorous confidentiality protocols, since apprehensions regarding data privacy and security can influence customer confidence. Financial institutions that incorporate openness into their online approaches while adhering to data privacy laws tend to foster enduring customer loyalty and gain a competitive edge (Awad et al., 2025). The incorporation of extensive data and artificial intelligence has transformed the management of customer relationships within the banking sector. Kopare et al. (2024) introduced frameworks powered by AI to tailor marketing strategies according to customer behavior and preferences. Sarkar et al. (2024) illustrated the application of clustering algorithms for efficient customer segmentation. These technologies significantly improve understanding of customer behaviors and empower banks to anticipate future actions, allowing for customized service offerings. Considerations of ethics and data privacy hold significant importance in the utilization of these technologies. Plangger et al. (2023) emphasized the importance of adopting careful and principled approaches to data collection, aiming to harmonize customer trust with the requirements of business operations. In a similar vein, Williams (2024) emphasized the significance of transparent data practices in building consumer trust.

Even with the progress made in e-marketing, obstacles like cybersecurity and adherence to regulations continue to exist. Khrais (2015) and Mannan and Oorschot (2008) highlighted the critical role that strong security measures play in fostering consumer trust in online banking. With increasing cyber threats, banks must invest in advanced security infrastructure to protect customer data and build trust.

The capacity of e-marketing to produce actionable customer insights has been a significant area of focus. The findings of Zhang and Yue (2019) further bolster this capability, emphasizing the role of AI in customizing marketing campaigns to address the unique requirements of various customer segments. The integration of extensive data, artificial intelligence, and the Internet of Things offers banks a distinctive chance to provide tailored experiences for their clients, enhancing satisfaction and fostering loyalty. Paschen et al. (2019) illustrated the importance of e-marketing tools in improving operational efficiency and fostering robust customer relationships.

The banking sector in Egypt offers a distinctive environment for utilizing e-marketing strategies. Research by Abdelrehim Awad (2024) indicated that public commercial banks in Egypt, including the National Bank of Egypt and Banque Misr, have progressively embraced digital platforms to enhance service accessibility and efficiency. The banks utilize digital marketing strategies such as mobile apps and email outreach to meet customer demands swiftly and efficiently. However, issues such as low digital literacy and resistance to technology adoption remain significant obstacles. Furthermore, Purtova (2011) emphasized concerns surrounding data privacy and security, which may erode customer confidence in digital platforms. The challenges highlighted emphasize the necessity for thorough approaches that tackle both technological and organizational obstacles to the adoption of e-marketing. Several investigations have examined the connection between various aspects of e-marketing and customer engagement within the banking industry. According to Yu et al. (2015), banks that utilized comprehensive e-marketing strategies experienced increased customer satisfaction levels. Additionally, D'Annunzio and Russo (2024) emphasized the necessity for further investigation into the combination of e-marketing and traditional marketing approaches to enhance its overall effectiveness. The ability of e-marketing to transform customer engagement goes well beyond conventional platforms. Zhang and Yue (2019) explored how the combination of big data, cloud computing, and IoT can enhance e-marketing strategies, allowing banks to better predict customer needs.

Additionally, the incorporation of blockchain technology can further secure and streamline transactions, providing customers with more confidence in the digital banking experience. Purtova (2011) examined the ethical and legal aspects of e-marketing, highlighting the necessity of transparent data practices to uphold customer trust.

Although the advantages of e-marketing are clear, there are still areas that require further exploration. For example, there is a scarcity of studies examining the long-term effects of adopting e-marketing in developing economies such as Egypt. Wang and Yu (2017) proposed that subsequent research should investigate the relationship between new technologies, like IoT and AI, and consumer behavior within the banking industry. Furthermore, D'Annunzio and Russo (2024) emphasized the importance of tackling organizational resistance and formulating strategies for the smooth incorporation of e-marketing tools into current banking systems. The significant impact of e-marketing in the banking sector is underscored by its capacity to tackle issues associated with customer diversity and changing market conditions. Paschen et al. (2019) highlighted the significance of implementing flexible marketing approaches that address the needs of various customer groups. According to Yu et al. (2015), digital platforms facilitate immediate feedback mechanisms, which empower banks to adjust their strategies in response to customer input. In conclusion, the existing body of work emphasizes the transformative potential of e-marketing in the banking sector. Utilizing platforms like websites, social media, email, and mobile applications allows banks to improve customer interaction and contentment, thereby securing a competitive advantage. Nonetheless, tackling the obstacles related to technological adoption and organizational resistance is essential for unlocking the complete potential of e-marketing.

Future research should explore the impact of emerging technologies like blockchain and augmented reality on e-marketing strategies. Furthermore, the dynamic nature of customer needs and technological advancements calls for continuous adaptation and innovation in e-marketing strategies, ensuring their relevance and effectiveness in a competitive market landscape.

This study suggests an enhanced framework for the Technology Acceptance Model (TAM) to account for the swift evolution of technologies like Artificial Intelligence (AI), Big Data, and Blockchain within the banking industry. The influence of these technologies extends beyond customer engagement strategies, significantly affecting the adoption and utilization of e-marketing tools. This research aims to provide innovative theoretical perspectives on the impact of AI-driven customer segmentation, personalization, and predictive analytics on customer behavior and satisfaction within the banking industry through the integration of advanced technologies.

Initially, the combination of AI and Big Data with the TAM framework offers a deeper insight into the acceptance of digital tools by customers, highlighting the significance of trust, usefulness, and ease of use in influencing their adoption. This method provides a refreshed viewpoint on the adoption of technology, moving past conventional constructs to incorporate the influence of immediate customer feedback and automated service provision (Yang et al., 2024).

Secondly, the study presents a novel model of digital consumer behavior that integrates the impact of Blockchain technology on trust and security within online banking services. This model seeks to address the existing gap by examining the ways in which emerging technologies influence customer expectations and play a role in the development of e-marketing strategies within the banking sector (Purtova, 2011). The integration of security considerations in customer relationship management is enhanced by blockchain's ability to foster trust and guarantee secure, transparent digital transactions (Zhang and Yue, 2019).

This proposed framework provides significant theoretical insights by modifying current models to illustrate how contemporary technologies influence customer behavior and service innovation in the banking industry. This viewpoint corresponds with the increasing movement in digital marketing that highlights customized, data-informed approaches utilizing cutting-edge technologies such as AI and Big Data to craft individualized customer experiences (Plangger et al., 2023). Furthermore, it broadens the scope of the TAM model by integrating the capabilities of emerging technologies to improve digital adoption and customer satisfaction within the banking industry (Sarkar et al., 2024).

The purpose of this research is to examine the role of e-marketing tools in shaping customer insights and enhancing engagement within the banking sector.

Through the review of the literature and to achieve the research purpose, the following hypotheses are proposed:

H1. There is a statistically significant relationship between the use of websites as an e-marketing tool and customer engagement in the banking sector.
H2. There is a statistically significant relationship between social media marketing and the enhancement of customer insights in the banking sector.
H3. Email marketing has a statistically significant impact on improving customer communication and satisfaction in the banking sector.

H4. Mobile application usage as an e-marketing tool significantly enhances customer interaction and service accessibility in the banking sector.

These hypotheses will guide the study's investigation into the critical dimensions of e-marketing within the banking industry and their effects on customer engagement and insights.

3. Methodology

This shapes customer insights and enhances engagement within the banking sector. The study combines both qualitative and quantitative approaches to ensure a comprehensive understanding of the phenomenon under investigation. The detailed aspects of the methodology are outlined as follows:

The descriptive analytical method was chosen due to its effectiveness in providing a detailed depiction of the variables and their interrelationships. This approach allows for an in-depth analysis of e-marketing tools and their impact on customer behavior within the banking sector. Quantitative data collection and analysis techniques are employed to examine the hypotheses and validate the findings.

The research population includes employees and customers of public commercial banks in Egypt, such as the National Bank of Egypt, Banque Misr, and Banque du Caire. These banks were selected due to their significant market share and wide adoption of e-marketing tools. The inclusion of diverse public commercial banks enhances the representativeness of the study's findings across different banking institutions in Egypt.

A stratified random sampling technique was employed to ensure representation across different customer demographics and employee roles. The sample size was determined using statistical sampling 20s with a 95% confidence level and a 5% margin of error. Based on these calculations, the sample size was set at 600 participants, comprising 300 employees and 300 customers. This stratification ensures that the sample reflects the diversity of the population in terms of age, gender, experience, and customer type. The following is Table 1, which provides a detailed description of the sample composition:

Table 1: Sample description

Category	Subcategory	Number of participants	Percentage
Employees	Senior Management	50	8.33%
	Middle Management	100	16.67%
	Frontline staff	150	25.00%
Customers	Retail banking clients	200	33.33%
	Corporate clients	100	16.67%
	VIP clients	50	8.33%
Total		600	100%

The study utilized a structured questionnaire as the primary data collection tool. The questionnaire was designed based on a thorough review of the literature and previous studies to ensure the inclusion of all relevant variables. The instrument included the following sections:

- Demographic Information: Questions to capture participants' age, gender, education level, job role, and years of experience.
- E-Marketing Tools: Items assessing the use and effectiveness of websites, social media, email, and mobile applications in customer engagement.
- Customer Insights: Questions evaluating how e-marketing tools contribute to understanding customer preferences, behaviors, and satisfaction.
- Engagement Metrics: Items measuring the level of customer interaction, loyalty, and satisfaction attributed to e-marketing practices.

The questionnaire employed a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to gauge respondents' perceptions.

A pilot study was conducted with 50 participants (25 employees and 25 customers) to test the reliability and validity of the questionnaire. Adjustments were made based on feedback to improve clarity and ensure the instrument's suitability for the main study. The Cronbach's alpha coefficient for the questionnaire was calculated at 0.88, indicating a high level of reliability.

The data collection process was conducted over three months. Questionnaires were distributed both in person and electronically to participants, ensuring maximum reach and response rate. Informed consent was obtained from all participants, and anonymity was guaranteed to encourage honest responses.

The collected data were analyzed using statistical techniques to validate the hypotheses and draw meaningful conclusions. The following methods were applied:

- Descriptive Statistics: Used to summarize demographic data and provide an overview of the participants' characteristics.
- Correlation Analysis: To examine the relationships between e-marketing tools and customer insights and engagement.
- Regression Analysis: To determine the predictive power of e-marketing tools on customer insights and engagement metrics.
- ANOVA Tests: Applied to identify significant differences in perceptions based on demographic variables.

All analyses were conducted using SPSS software to ensure accuracy and reliability.

The study adhered to ethical research standards, ensuring voluntary participation and confidentiality. Participants were informed of the study's purpose, and their consent was obtained prior to data collection. The research was reviewed and approved by an institutional ethics committee.

While this research provides valuable insights, it is not without limitations. The focus on Egyptian public commercial banks may limit the generalizability of the findings to other contexts. Additionally, self-reported data may be subject to biases such as social desirability. Future research should consider longitudinal designs and broader geographic scopes to address these limitations.

4. Results

This section presents the results of the study, analyzing the role of e-marketing tools in customer engagement and insights within the banking sector. A combination of descriptive statistics, reliability tests, correlation analysis, regression analysis, and variance inflation factor (VIF) tests were conducted to ensure the robustness and validity of the findings.

4.1. Reliability and internal consistency analysis

To ensure the accuracy and reliability of the data collection instrument, a reliability analysis was conducted using Cronbach's alpha. The overall Cronbach's alpha coefficient was calculated as 0.88, indicating high internal consistency of the questionnaire.

Table 2 demonstrates that all variables achieved Cronbach's alpha values above the acceptable threshold of 0.70, confirming the reliability of the measurement scales.

Table 2: Reliability coefficients of study variables

Variable	Number of items	Cronbach's alpha
Websites	8	0.84
Social media	10	0.86
Email marketing	6	0.82
Mobile applications	7	0.89
Overall	31	0.88

4.2. Multicollinearity and variance inflation factor (VIF)

Multicollinearity occurs when independent variables in a regression model are highly correlated, leading to inflated standard errors and unreliable coefficient estimates. This can distort the significance of predictor variables, making it difficult to determine their true impact. To assess the presence of multicollinearity in our regression models, we calculated the Variance Inflation Factor (VIF) for each independent variable. The VIF values are presented in Table 3.

Table 3: Variance inflation factors (VIF) results

Independent variable	VIF score
Websites	2.11
Social media	2.34
Email marketing	1.98
Mobile applications	2.21

The Variance Inflation Factor (VIF) is a measure that quantifies how much the variance of an estimated regression coefficient increases due to collinearity among the predictor variables.

- A VIF value of 1 indicates no correlation between a predictor and other independent variables.
- A VIF between 1 and 5 suggests a moderate correlation, but it is generally acceptable.
- A VIF above 10 is considered problematic, indicating severe multicollinearity, which can undermine the reliability of the regression results.

In this study, all VIF values fall below the critical threshold of 10, indicating that multicollinearity is not a concern in our regression models. However, a deeper look at the specific values provides additional insights:

1. Websites (VIF = 2.11)

- Websites as an e-marketing tool show moderate correlation with other variables, particularly mobile applications and social media. This makes sense as banks integrate websites with mobile applications and social media platforms for a seamless customer experience.
- The relatively low VIF value (2.11) suggests that while websites contribute significantly to engagement, they do not heavily overlap with other independent variables.

2. Social media (VIF = 2.34)

- Social media has the highest VIF (2.34) among the four variables, indicating some correlation with websites and mobile applications.
- This is expected because social media platforms often redirect customers to websites and are integrated with mobile banking applications.
- Despite this correlation, the VIF remains well below problematic levels, confirming that social media's effect on customer engagement remains distinct.

3. Email Marketing (VIF = 1.98)

- Email marketing has the lowest VIF value, indicating minimal correlation with other e-marketing tools.
- Unlike social media and websites, which are highly interactive and real-time, email marketing is a more traditional and asynchronous form of engagement.
- This suggests that email marketing acts independently in shaping customer insights and engagement, making it a unique predictor variable.

4. Mobile Applications (VIF = 2.21)

- Mobile applications have a moderate correlation with websites and social media since banks frequently integrate their mobile services with website functionalities.

- However, with a VIF of 2.21, there is no concern that mobile applications are redundant predictors in the regression model.
- This confirms that mobile applications uniquely contribute to customer engagement beyond the effects of websites and social media.

Additional Robustness Check: Condition Index: To further validate the absence of multicollinearity, we computed the Condition Index (CI), which helps identify structural dependencies among independent variables.

- A Condition Index below 10 is acceptable.
- A Condition Index between 10 and 30 suggests potential multicollinearity but is not severe.
- A Condition Index above 30 indicates problematic collinearity.

The Condition Index for this model was 4.73, confirming that multicollinearity is not a concern. Implications of the VIF Analysis:

- The low to moderate VIF values confirm that each independent variable contributes uniquely to customer engagement.
- The lack of severe multicollinearity suggests that our regression model provides reliable estimates for determining the impact of each e-marketing tool.
- The integration of multiple e-marketing tools (websites, social media, email marketing, and mobile applications) is evident, but each tool maintains sufficient independence to be treated as a separate variable.

The VIF results provide strong evidence that multicollinearity is not an issue in this study. Each e-marketing tool has a unique contribution to customer engagement, allowing for accurate interpretation of regression coefficients.

4.3. Hypothesis testing and regression analysis

To test the hypotheses, correlation analysis and multiple regression models were applied. The Adjusted R^2 values were computed to assess the explanatory power of each model.

- Hypothesis 1: Websites and Customer Engagement

To examine the relationship between websites as an e-marketing tool and customer engagement, a multiple regression analysis was conducted as shown in Table 4.

Table 4: Regression analysis for websites and customer engagement

Variable	β coefficient	Standard error	t-value	p-value
Websites	0.72	0.085	8.47	< 0.01
Constant	1.43	0.214	6.67	< 0.01
Adjusted R^2	0.51	-	-	-

The results in Table 4 indicate that websites have a significant positive impact on customer engagement ($\beta = 0.72$, $p < 0.01$). The model explains 51% of the variance in customer engagement.

- Hypothesis 2: Social Media and Customer Insights

To test the relationship between social media marketing and customer insights, hierarchical regression analysis was conducted as shown in Table 5 to control for potential confounding variables.

As shown in Table 5; the inclusion of control variables slightly reduced the β coefficient, but social media remains a strong predictor of customer insights ($\beta = 0.62$, $p < 0.01$). The adjusted R^2 values suggest that social media explains 44% of the variance in customer insights.

- Hypothesis 3: Email Marketing and Customer Satisfaction

The impact of email marketing on customer satisfaction was tested using correlation and regression analysis as shown in Table 6.

Table 6 confirms a moderate but significant positive correlation ($r = 0.54$, $p < 0.01$).

- Hypothesis 4: Mobile Applications and Customer Interaction

A multiple regression analysis was performed to examine the effect of mobile applications on customer interaction.

As shown in Table 7; the highest impact was observed on mobile applications ($\beta = 0.78$, $p < 0.01$). This suggests that mobile applications significantly enhance customer interaction, with an explained variance of 56%.

4.4. Robustness checks

To confirm the stability of the results, additional robust tests were conducted:

- Bootstrapping Analysis: Resampling with 500 iterations confirmed that the regression coefficients remained significant.
- Interaction Effects: Interaction terms (e.g., social media × age group) showed that younger customers benefited more from social media campaigns than older customers.
- Heteroskedasticity Test: No signs of heteroskedasticity were found, validating the assumption of homoscedasticity.

The results confirm the validity of the research hypothesis, as summarized in Table 8.

5. Discussion

The findings of this study provide critical insights into the transformative role of e-marketing tools in the banking sector, emphasizing their ability to shape customer insights and enhance engagement. The results confirmed statistically significant relationships between various e-marketing tools and customer engagement, highlighting their relevance in the digital transformation of banking practices.

Table 5: Hierarchical regression analysis for social media and customer insights

Model	Variable	β coefficient	Standard error	t-value	p-value
Model 1	Social media	0.65	0.067	9.03	< 0.01
Model 2	Social media	0.62	0.065	8.79	< 0.01
	Control variables	Yes	-	-	-
Adjusted R^2 (Model 1)	0.42	-	-	-	-
Adjusted R^2 (Model 2)	0.44	-	-	-	-

Table 6: Correlation between email marketing and customer satisfaction

Variable	r	p-value
Email marketing	0.54	< 0.01

Websites emerged as a foundational e-marketing tool, demonstrating a strong positive correlation with customer engagement ($r = 0.72$, $p < 0.01$). This finding aligns with prior research, such as Sharabati et al. (2024), who emphasized that digital marketing strategies, including the use of websites, act as essential platforms for delivering information and facilitating seamless customer interactions. The usability and accessibility of banking websites play a crucial role in enhancing customer experience, particularly when they incorporate real-time support systems, AI-driven chatbots, and personalized dashboards. Given the increasing customer expectations for digital services, banks must continually invest in website optimization, integrating advanced technologies such as predictive analytics to provide personalized recommendations and improve engagement.

Table 7: Regression analysis for mobile applications and customer interaction

Variable	β coefficient	Standard error	t-value	p-value
Mobile applications	0.78	0.059	10.22	< 0.01
Constant	1.19	0.210	5.67	< 0.01
Adjusted R^2	0.56	-	-	-

Table 8: Summary of hypotheses testing results

Hypothesis	Result	Statistical evidence
H1: Websites → customer engagement	Supported	$\beta = 0.72$, $p < 0.01$
H2: Social media → customer insights	Supported	$\beta = 0.65$, $p < 0.01$
H3: Email marketing → customer satisfaction	Supported	$r = 0.54$, $p < 0.01$
H4: Mobile applications → customer interaction	Supported	$\beta = 0.78$, $p < 0.01$

Social media marketing significantly impacted customer insights ($\beta = 0.65$, $p < 0.01$), reinforcing its role as a key communication tool that allows banks to engage with customers more dynamically. These findings support Yadav and Rahman (2018), who highlighted that social media platforms enhance customer loyalty through interactivity and informativeness. Participants in this study emphasized that targeted social media campaigns play a critical role in understanding customer preferences and improving their overall banking experience. The ability of social media to facilitate instant feedback loops, sentiment analysis, and customer segmentation enables banks to personalize interactions, thereby increasing customer trust and satisfaction. Given the preference for visual and interactive content, banks should leverage video marketing, influence collaborations, and AI-powered chatbots to enhance engagement and improve customer retention.

Email marketing exhibited a moderate but significant positive correlation with customer satisfaction ($r = 0.54$, $p < 0.01$). While personalized emails providing relevant updates and promotions were appreciated by customers, concerns about email fatigue were noted. This result aligns with Wang and Yu (2017), who advocated for a balanced approach to email marketing to prevent oversaturation and disengagement. Advanced AI-based segmentation can improve the effectiveness of email marketing by analyzing recipient behavior and adjusting content delivery to match individual preferences. Banks should focus on behavioral analytics to track email open rates, optimize timing, and implement predictive automation, ensuring that customers receive valuable content without excessive intrusions.

Mobile applications were identified as the most impactful e-marketing tool ($\beta = 0.78$, $p < 0.01$), confirming their central role in modern banking experiences. Features such as mobile banking, real-time payment processing, biometric authentication, and AI-driven virtual assistants were highly valued by customers, while employees also recognized their role in reducing workload through automation. These findings align with Jain and Jain (2022), who emphasized the growing reliance on mobile applications for delivering personalized banking services. The widespread adoption of mobile banking, particularly among younger demographics, indicates a shift toward fully digital financial ecosystems, where customers expect seamless and secure transactions, instant access to financial insights, and AI-enhanced decision-making tools. Banks should invest in the continuous evolution of mobile applications, integrating emerging technologies such as blockchain for secure transactions and AI-powered financial planning tools to further improve user experience and engagement.

The study further revealed demographic variations in the preference for e-marketing tools. Younger respondents (20-35 years) exhibited a stronger preference for mobile applications and social media, while older respondents (51+ years) favored websites and email marketing. These findings emphasize the need for banks to develop segmented e-marketing strategies that cater to different generational preferences. Banks should implement AI-driven content personalization, age-specific marketing strategies, and cross-platform engagement tactics to ensure inclusivity across all customer demographics. This aligns with the adaptive marketing framework proposed by Paschen et al. (2019), which advocates targeted service delivery to diverse consumer groups. Moreover, integrating sustainability-based performance analysis using Data Envelopment Analysis (DEA) models could offer a robust framework for evaluating the long-term efficiency of digital marketing strategies across economic, environmental, and social dimensions (Hosseini et al., 2018).

Despite the benefits of e-marketing tools, the study identified several challenges in their adoption, including technological barriers, organizational resistance, and ethical concerns. These findings align with the importance of addressing resistance to digital transformation. One major challenge is the integration of advanced e-marketing technologies with legacy banking systems, which often lack the infrastructure necessary for seamless digital adaptation. Additionally, employees' reluctance to adopt AI-driven automation remains an obstacle, underscoring the need for comprehensive digital training and changing management programs.

Another pressing issue is data privacy and ethical concerns. As banks increasingly rely on AI and big data analytics to drive marketing strategies, customer apprehension regarding data security, transparency, and potential misuse has grown. These concerns are consistent with Plangger et al. (2023), who emphasized the necessity of transparent data governance and regulatory compliance. Banks must adopt stringent data protection measures, ensure compliance with global data security regulations, and establish clear privacy policies to maintain customer trust.

While this study provides valuable insights, it has several limitations that must be considered. The focus on Egyptian public commercial banks may limit the generalizability of the findings, as customer behavior and e-marketing effectiveness may vary across different banking sectors, particularly private and international banks. Additionally, the cross-sectional nature of the study restricts the ability to assess long-term behavioral trends, making it difficult to evaluate how customer engagement evolves over time in response to technological advancements and shifting market dynamics.

Future research should consider longitudinal studies to track the sustained impact of e-marketing adoption over time, capturing how customer behaviors and digital preferences evolve. Expanding the research scope to include private banks, fintech companies, and multinational institutions could enhance the external validity of the findings and provide a comprehensive global perspective. Moreover, investigating the impact of emerging technologies such as blockchain-driven security, augmented reality (AR)-enhanced customer interactions, and AI-powered predictive analytics on customer engagement would provide novel insights into the future of e-marketing strategies.

Another critical area for future exploration is the measurement of e-marketing return on investment (ROI), which remains an underexplored aspect of digital banking transformation. Examining the financial impact of digital marketing investments on customer retention, revenue generation, and operational efficiency could offer valuable strategic guidance for banking institutions. Additionally, future studies should assess the intersection of e-marketing and financial inclusion, exploring how digital tools can expand banking accessibility for underserved populations, particularly in emerging economies.

In conclusion, this study underscores the pivotal role of e-marketing tools in transforming customer engagement and enhancing digital banking experiences. By leveraging websites, social media, email marketing, and mobile applications, banks can optimize customer interactions, build stronger relationships, and maintain a competitive edge in an increasingly digitized financial landscape. However, addressing technological, organizational, and ethical challenges is crucial for maximizing the effectiveness of e-marketing strategies. As AI, blockchain, and immersive technologies continue to evolve, future research must explore their long-term impact on customer relationships, security, and financial inclusion. Embracing continuous innovation, regulatory adaptation, and ethical digital practices will be key to ensuring that e-marketing remains a sustainable and transformative force in the banking sector.

6. Conclusion

This study explored the role of e-marketing tools in shaping customer insights and enhancing engagement within the banking sector, with a particular focus on public commercial banks in Egypt. The findings confirmed the significant impact of digital marketing strategies, demonstrating how websites, social media platforms, email marketing, and mobile applications contribute to customer relationship management and overall satisfaction. By integrating these tools effectively, banks can create personalized customer experiences, foster loyalty, and maintain a competitive edge in an increasingly digitalized financial landscape.

The results highlighted that websites serve as a fundamental component of e-marketing, providing a reliable platform for customer interactions and service accessibility. Well-designed, user-friendly interfaces that incorporate real-time support and AI-driven assistance significantly enhance customer satisfaction and trust. Social media marketing emerged as a powerful tool for capturing customer insights and fostering engagement, enabling banks to analyze customer behavior, respond to inquiries in real-time, and deliver personalized content. Email marketing proved effective in maintaining ongoing communication and trust, though its success depends on strategic implementation to avoid customer fatigue. Among all e-marketing tools, mobile applications had the highest impact, offering real-time transaction capabilities, AI-powered financial management tools, and personalized banking experiences that strengthen customer relationships.

The study also identified demographic differences in the preference for e-marketing tools, reinforcing the need for segmented digital marketing strategies tailored to different customer groups. Younger customers exhibited a stronger preference for mobile applications and social media, while older customers favored websites and email marketing. These insights underscore the importance of adaptive marketing approaches that align digital banking services with evolving customer expectations.

Despite the benefits of e-marketing, the study revealed several challenges hindering its full adoption, including technological barriers, organizational resistance, and data privacy concerns. Overcoming these challenges requires a comprehensive strategy that includes investment in advanced digital infrastructure, employee training to enhance technological adaptability and the development of stringent cybersecurity measures to build customer trust. Banks must also adopt ethical data governance practices and comply with evolving regulatory frameworks to ensure transparency and security in digital transactions. Additionally, policymakers play a crucial role in creating supportive regulations that balance innovation with consumer protection.

While this study provides valuable insights, its focus on public commercial banks in Egypt may limit the generalizability of the findings to private or international banks. Future research should explore the impact of e-marketing strategies in diverse financial sectors, including fintech firms and global banking institutions, to provide a broader understanding of digital transformation in financial services. Further studies should also investigate the integration of emerging technologies such as blockchain, augmented reality, and AI-driven predictive analytics into e-marketing frameworks. Examining the long-term impact of e-marketing on customer retention, financial performance, and operational efficiency would offer deeper insights into the effectiveness of digital marketing investments in the banking sector.

The study underscores the transformative potential of e-marketing tools in enhancing customer engagement and optimizing banking services. By leveraging advanced digital strategies, banks can strengthen customer relationships, improve service efficiency, and maintain a competitive advantage in an increasingly technology-driven financial landscape. The future of banking will be defined by continuous innovation, customer-centric digital solutions, and ethical marketing practices that prioritize security, transparency, and trust.

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Compliance with ethical standards

Ethical considerations

This study adhered strictly to ethical research standards throughout its design, implementation, and analysis phases. Participation in the study was voluntary, and informed consent was explicitly obtained from all respondents before data collection began. This consent was incorporated into the introduction section of the survey, where participants were informed about the purpose of the study, their rights to withdraw at any time without consequences, and the confidentiality of their responses. To ensure anonymity, no personally identifiable information was collected, and all responses were stored securely and used solely for academic purposes. The survey was reviewed to minimize psychological, legal, or social risks to participants, and all data were reported in aggregate form to avoid individual identification. The researchers made every effort to uphold the dignity, rights, and welfare of the participants throughout the research process.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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