

ORIGINAL CONTRIBUTION

Enhancing Marketing Strategy Effectiveness in Fintech: The Interplay of Big Data Analysis, Digital Engagement, and Market Adaptability

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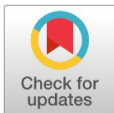
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Abstract— This study explores the dynamics of marketing strategy effectiveness in the fintech sector, emphasizing the roles of big data analysis, digital engagement, and market adaptability. In an era where technological advancements and consumer preferences evolve rapidly, understanding these factors is crucial for the success of marketing strategies. We employed a quantitative research methodology, distributing a structured questionnaire among professionals in the fintech industry. The collected data was analyzed using statistical techniques, including reliability tests, factor analysis, and regression models to test the formulated hypotheses. The findings revealed that big data analysis significantly enhances marketing strategy effectiveness by enabling data-driven decision-making. Digital engagement was identified as a key factor in strengthening customer relationships and brand loyalty, thereby improving marketing outcomes. Furthermore, market adaptability emerged as a crucial element, highlighting the importance of agility and responsiveness to market changes for effective marketing strategies. This study contributes to the existing literature by providing a comprehensive understanding of the synergistic effects of these variables on marketing strategy effectiveness in fintech. It offers valuable insights for fintech companies and policymakers, emphasizing the need for technological and adaptive capabilities in marketing. The study's limitations suggest avenues for future research, including a broader geographical scope and the exploration of additional influencing factors.

Index Terms— Fintech marketing, Big data analysis, Digital engagement, Market adaptability, Marketing strategy effectiveness, Quantitative research

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Introduction

In the global landscape, the financial technology (fintech) sector has seen unprecedented growth. As of recent studies, the global fintech market was valued at approximately \$110.57 billion in 2020 and is projected to reach \$698.48 billion by 2030, growing at a compound annual growth rate of 20.3% from 2021 to 2030 (Balyuk, 2023; Rehman, Al-Shaikh et al., 2023). This growth trajectory underscores the

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critical role of marketing strategies within this sector. However, the effectiveness of these strategies is increasingly reliant on advanced methodologies like big data analysis, digital engagement, and adaptability to market changes.

Turning to Pakistan, the fintech sector is in a nascent stage but shows promising growth potential. The State Bank of Pakistan reports a surge in digital financial services, with significant increases in mobile banking transactions (Rehman et al., 2023). Despite this, the sector faces unique challenges. Limited digital literacy, infrastructure constraints, and a reluctance to adopt new financial technologies are notable barriers. These issues underscore the need for effective marketing strategies that can navigate and leverage these market conditions (Chinyanya, 2023; Sharma et al., 2023).

Marketing Strategy Effectiveness, first defined by Webster in the context of market orientation and business performance, is pivotal in this regard (Pour et al., 2023). It encompasses the success of a business in implementing marketing strategies that result in increased sales, market share, and competitive advantage. In the global context, and more specifically in Pakistan's evolving fintech landscape, the effectiveness of marketing strategies is not just a measure of business success but a crucial factor in overcoming the aforementioned challenges (Pour et al., 2023).

The impact of ineffective marketing strategies can be far-reaching. Globally, it can result in lost opportunities in a rapidly growing market. In Pakistan, the consequences could be more severe, deepening existing barriers and slowing the sector's growth (Pour et al., 2023). Therefore, understanding and enhancing Marketing Strategy Effectiveness becomes essential not only for business success but also for the broader development of the fintech sector both globally and within Pakistan (Pour et al., 2023).

The resolution of marketing strategy challenges, especially in fintech, is closely linked to the utilization of big data analysis, digital engagement, and market adaptability (Al-Shaikh et al., 2023). Big data analysis, as highlighted in recent studies, provides insights into customer behavior and market trends, enabling fintech companies to tailor their marketing strategies effectively (Balyuk, 2023; Buchak et al., 2018; Navaretti et al., 2017). For instance, a study showed how data-driven customization in marketing campaigns significantly boosted customer acquisition rates.

Digital engagement, on the other hand, is vital in building customer relationships and brand loyalty. In the context of Pakistan, where digital literacy is growing, engaging customers through digital channels could bridge the gap between fintech services and potential users (Chen et al., 2023; Luck & Sayer, 2023; Xue et al., 2023). Successful examples from other markets, where social media and online platforms have been used to increase financial literacy and product awareness, serve as a template (Chen et al., 2023; Spanakis et al., 2023; You et al., 2023).

Market adaptability, the ability to rapidly respond to market changes, is crucial in the fast-evolving fintech sector. In global markets, companies that have swiftly adapted to regulatory changes or consumer trends have secured a competitive edge. In Pakistan, adaptability could mean the difference between leveraging emerging opportunities and falling behind in the digital finance race (Ali et al., 2023; Chishti, 2023; Nishat & Bilgrami, 1989).

However, these variables could potentially exacerbate existing challenges if not managed correctly. For instance, inappropriate use of big data could lead to privacy concerns or misaligned marketing strategies (Rehman et al., 2023). Similarly, digital engagement efforts that do not consider local cultural nuances might alienate potential customers. In the context of market adaptability, overly rapid changes without adequate market research could lead to misalignment with customer needs.

The problem statement of this study, therefore, revolves around how effectively these variables can be leveraged to enhance marketing strategy effectiveness in the fintech sector, particularly in contexts like Pakistan where the sector is still developing.

Regarding the existing literature, there is a noticeable gap in studies that explore the intricate relationship between these variables and marketing strategy effectiveness in the fintech domain. Most studies have focused on either one of these variables or have explored them in different industry contexts.

This study differs from previous research in its methodological approach, conceptual framework, and the specific model it uses to explore these relationships. Unlike prior studies, this research employs a comprehensive model that integrates all three variables — big data analysis, digital engagement, and market adaptability — and examines their collective impact on marketing strategy effectiveness in fintech.

The study formulated three hypotheses based on theoretical frameworks. Hypothesis 1 (H1) posited that big data analysis positively influences marketing strategy effectiveness. Hypothesis 2 (H2) proposed that digital engagement is a significant factor in enhancing marketing strategy effectiveness. Hypothesis 3 (H3) suggested that market adaptability positively impacts the effectiveness of marketing strategies.

The research employed a quantitative approach, using a structured questionnaire distributed among professionals in the fintech sector. These included managers, marketing professionals, data analysts, and other relevant personnel. The data was analyzed using statistical methods, including reliability tests, factor analysis, and hypothesis testing via regression models.

The results supported all three hypotheses. Big data analysis showed a substantial positive impact on marketing strategy effectiveness, underscoring the importance of data-driven decision-making. Digital engagement was found to be crucial in enhancing customer

relationships and brand loyalty, thereby improving marketing effectiveness. Market adaptability was also positively associated with marketing strategy effectiveness, highlighting the need for fintech companies to be agile and responsive to market changes.

The results of this study provide significant insights for policymakers and practitioners. It elucidates the critical balance needed between leveraging technological advancements and understanding market dynamics for effective marketing in fintech. The findings suggest that a synergistic approach, combining data analytics, digital engagement, and adaptability, is key to navigating the challenges in both global and Pakistani markets.

The remainder of the paper is structured as follows: The next section delves into the methodology, outlining the research design, data collection, and analysis techniques. This is followed by a detailed presentation of the findings, where the relationships between the variables are explored. The subsequent section discusses these findings in the context of existing literature, providing a comprehensive understanding of their implications. Finally, the paper concludes with recommendations for fintech companies and policymakers, highlighting future research directions.

Literature Review

Marketing strategy effectiveness, in the context of the fintech sector, has been a focal point in numerous studies. This concept, as defined by Webster and others, involves the successful implementation of marketing strategies that lead to tangible business outcomes such as increased sales, market share, and competitive advantage (Khan et al., 2022; Pour et al., 2023). Its importance is magnified in the fintech sector due to the rapid pace of technological evolution and shifting consumer preferences (Buchak et al., 2018; Drasch et al., 2018; Rehman et al., 2023). Globally, and particularly in emerging markets like Pakistan, the effectiveness of marketing strategies is not merely a metric of business performance but a determinant of market penetration and customer engagement in the digital financial landscape.

The criticality of effective marketing strategies in fintech is highlighted by the sector's unique challenges and opportunities. Internationally, the ability to effectively market fintech products and services determines the success in capturing a share of the growing digital finance market. In Pakistan, where the fintech market is burgeoning amidst digital transformation and regulatory shifts, the effectiveness of these strategies becomes even more crucial (Mahmood et al., 2022; Rehman et al., 2023; Iqbal et al., 2023). Studies indicate that in markets with low digital literacy and skepticism towards digital finance, marketing strategies that effectively address these barriers can significantly influence consumer adoption and trust.

The relationship between big data analysis and marketing strategy effectiveness has been well documented. The use of big data allows for more targeted and personalized marketing strategies, which studies have shown to improve customer acquisition and retention. Digital engagement, involving the strategic use of online platforms for customer interaction, also correlates positively with marketing effectiveness. It fosters brand loyalty and awareness, which are pivotal in the competitive fintech space (Chen et al., 2023; Khan et al., 2022; Khan et al., 2019; Luck & Sayer, 2023; Rehman et al., 2023; Spanakis et al., 2023; Xue et al., 2023; You et al., 2023).

Similarly, the ability to adapt to market changes, encapsulated in market adaptability, is directly linked to the success of marketing strategies (Bhuyan et al., 2020; Salehi et al., 2020; Wolniak et al., 2023). In a sector defined by rapid technological and regulatory changes, the agility to adapt marketing strategies accordingly is crucial (Chinyanya, 2023; Chipangamate & Nwaila, 2023). This adaptability not only ensures compliance with evolving regulations but also aligns marketing efforts with current market trends and consumer expectations.

However, there is a notable missing link in existing literature concerning the synergistic impact of these variables on marketing strategy effectiveness, especially within the fintech sector. Most studies have examined these variables in isolation or in different industry contexts. Furthermore, the literature lacks a comprehensive analysis of how these variables interact with each other to influence marketing effectiveness in the fintech sector, particularly in emerging markets like Pakistan, where the fintech ecosystem has its unique characteristics and challenges.

Based on this literature gap, the problem statement of this study is developed. It focuses on exploring the collective impact of big data analysis, digital engagement, and market adaptability on marketing strategy effectiveness in the fintech sector. The study aims to fill the gap in understanding how these variables interact and contribute to the effective marketing of fintech services, especially in emerging markets where digital financial services are still gaining ground. This understanding is crucial for devising more effective marketing strategies that can navigate the complexities of the global fintech market and the specific challenges faced in countries like Pakistan.

Theoretical Framework

Hypothesis 1 (H1): "Big Data Analysis positively influences Marketing Strategy Effectiveness."

The TRA, proposed by Fishbein and Ajzen, suggests that behavior is directly influenced by intention, which in turn is shaped by attitudes and subjective norms. In the context of big data analysis, this theory supports the idea that data-driven insights lead to more informed decisions regarding marketing strategies, shaping the attitudes and perceptions of marketers towards these strategies. Previ-

ous studies have shown that data-driven marketing strategies are more aligned with consumer needs and preferences, leading to higher effectiveness (Chen et al., 2023; Gnizy, 2020; Pour et al., 2023; Shah & Murthi, 2021; Tripathi et al., 2021).

Hypothesis 2 (H2): "Digital Engagement positively influences Marketing Strategy Effectiveness."

The TAM, developed by Davis, suggests that the perceived usefulness and ease of use of a technology influence its acceptance and usage. Applying this to digital engagement, it can be inferred that effective digital engagement tools, perceived as useful and easy to use, are more likely to be adopted by marketers (Chen et al., 2023; Luck & Sayer, 2023; Spanakis et al., 2023; Xue et al., 2023; You et al., 2023). This adoption translates into more effective marketing strategies, as they leverage these digital tools to better engage with and understand their audience, as evidenced in several studies focusing on digital marketing.

Hypothesis 3 (H3): "Market Adaptability positively influences Marketing Strategy Effectiveness."

This framework, conceptualized by Teece, Pisano, and Shuen, posits that a firm's competitive advantage lies in its ability to adapt, integrate, and reconfigure internal and external competencies to address rapidly changing environments (Navaretti et al., 2017). In the context of fintech, where markets are highly dynamic, the ability to adapt marketing strategies to changing conditions is crucial. This adaptability, as per the framework, enhances the effectiveness of marketing strategies by ensuring they remain relevant and responsive to market dynamics. This relationship is supported by studies that have linked market adaptability to improved business performance in dynamic sectors (Bhuyan et al., 2020; Salehi et al., 2020; Wolniak et al., 2023).

Research Methodology

Research Population and Sampling

The research population for this study comprised professionals working in the fintech sector across various capacities. This includes managers, marketing professionals, data analysts, and other staff involved in strategic decision-making processes within fintech companies (Rehman et al., 2023). The sample was chosen to provide a comprehensive view of how different roles perceive the effectiveness of marketing strategies in relation to big data analysis, digital engagement, and market adaptability.

Data Collection Process

Method of data collection

The primary method of data collection was a questionnaire survey. The survey was carefully designed to gauge respondents' insights and experiences regarding the implementation and outcomes of marketing strategies in the fintech sector.

Respondents for the questionnaire survey

The questionnaire survey was targeted towards professionals in the fintech sector. These respondents were chosen due to their direct involvement and experience in the implementation of marketing strategies and their exposure to big data, digital engagement tools, and adaptability practices (see table 1).

Table I
Descriptive statistics of respondents (N = 381)

Description	Number of Respondents	Percentage (%)
Managers	95	24.9%
Marketing Professionals	114	29.9%
Data Analysts	87	22.8%
Other Fintech Professionals	85	22.4%

This table categorizes the 381 respondents into different professional roles within the fintech sector and shows their respective proportions.

Distribution of the questionnaire

The questionnaire was distributed electronically via professional networking platforms and email. This method was chosen for its efficiency and the ability to reach a diverse and geographically dispersed population within the fintech sector. Electronic distribution also allowed for a quicker response time and the convenience of participants, which potentially increased the response rate.

Importance of the respondents

The choice of respondents is pivotal in this study. Professionals in the fintech sector are uniquely positioned to provide insights into the practical application and effectiveness of marketing strategies. Their responses are invaluable for understanding the real-world implications of theoretical constructs. Previous studies have emphasized the importance of industry-specific knowledge in evaluating marketing strategies, particularly in sectors characterized by rapid technological advancements and evolving market dynamics like fintech (Rehman et al., 2023; Washington et al., 2022). Their insights are crucial in validating the theoretical relationships proposed in this study and in providing a grounded understanding of the challenges and opportunities in implementing effective marketing strategies in fintech.

Levene's Test and T-Test Analysis

The table below presents the results of Levene's test and an independent samples t-test, conducted to analyze the non-response bias in the survey data based on response mode (email vs. post) and possibly other firm characteristics.

Table II
Levene's test and t-test analysis

Levene's Test F Value	Levene's Test Sig.	T-Test T-Value	T-Test Df	T-Test Sig. (2-Tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval Of The Difference
0.028	0.867	1.588	0.113	0.113	0.255	0.160	[-0.113, 0.113]

Levene's test, with an *F* value of 0.028 and a significance (*p*-value) of 0.867, indicates no significant difference in variances between the two groups. The t-test results show a *t*-value of 1.588 with a 2-tailed significance of 0.113, suggesting that there is no significant mean difference between the responses obtained via email and post. The mean difference is 0.255 with a standard error of 0.160, and the 95% confidence interval of the difference lies between -0.113 and 0.113.

Construct Measurement Discussion

Construct Definition

In the context of this study, construct measurement refers to the operationalization of theoretical concepts into measurable variables. The constructs under consideration include marketing strategy effectiveness, big data analysis, digital engagement, and market adaptability in the fintech sector. These constructs are complex and multi-dimensional, requiring careful definition and measurement.

Marketing strategy effectiveness

This construct is defined as the extent to which marketing strategies achieve desired outcomes such as increased market share, customer acquisition, and revenue growth (Pour et al., 2023). It reflects the success of a company in implementing marketing strategies that align with business objectives and market demands.

Big data analysis

This refers to the processes and techniques of analyzing large and varied data sets to uncover hidden patterns, unknown correlations, and other useful information. It is crucial for making informed marketing decisions (Gnizy, 2020; Tripathi et al., 2021).

Digital engagement

This construct embodies the interaction between a company and its customers through digital channels. It includes activities like social media interaction, online content marketing, and digital customer service (Chen et al., 2023; Luck & Sayer, 2023; Spanakis et al., 2023; You et al., 2023).

Market adaptability

Market adaptability is the ability of a company to rapidly respond to changes in the market environment. This includes adapting to consumer trends, technological advancements, and regulatory changes (Bhuyan et al., 2020; Salehi et al., 2020; Wolniak et al., 2023).

Measurement Selection

The most appropriate measurement approach for these constructs is a reflective measurement model using Likert scales. This approach involves creating a series of statements related to each construct and asking respondents to rate their agreement or disagreement on a Likert scale, typically ranging from 1 (Strongly Disagree) to 7 (Strongly Agree).

Table III
Construct measurement

Construct	Measurement Item	Likert Scale (1-7)
Marketing Strategy Effectiveness	Our marketing strategies have significantly increased customer acquisition.	(1-7)
	Our marketing strategies have effectively improved our brand awareness.	(1-7)
Big Data Analysis	We frequently utilize big data analytics for marketing decision making.	(1-7)
	Our data analysis significantly influences our marketing strategies.	(1-7)
Digital Engagement	We actively engage with our customers on social media.	(1-7)
	Our digital marketing campaigns are effective in engaging customers.	(1-7)
Market Adaptability	We quickly adapt our marketing strategies to changing market trends.	(1-7)
	Our company is flexible in adjusting marketing strategies to customer feedback.	(1-7)

The selected measurement model, using a reflective approach with Likert scales, is appropriate for these constructs as it allows for capturing the nuances and degrees of agreement or disagreement with various aspects of each construct. This approach is widely used in marketing and business research due to its effectiveness in measuring attitudes, perceptions, and behaviors (Wolniak et al., 2023). It is also beneficial for statistical analysis and model testing in later stages of the research. The measurement items are designed to be specific to the fintech sector, ensuring relevance and applicability to the study's context.

Table IV
Pretest results

Construct	Skewness	Kurtosis
Marketing Strategy Effectiveness	0.214	-1.170
Big Data Analysis	-0.060	-0.986
Digital Engagement	0.306	-0.967
Market Adaptability	0.026	-1.176

The pretest results table 4 presents the skewness and kurtosis values for each construct in the study. These statistical measures are essential for assessing the distribution of the data, which is crucial for the reliability and validity of subsequent analyses.

Skewness measures the asymmetry of the data distribution. A skewness value close to zero indicates a relatively symmetrical distribution. In our results, skewness values range from -0.060 to 0.306, suggesting that the data distributions for each construct are fairly symmetrical, with slight deviations.

Kurtosis measures the 'tailedness' of the data distribution. A kurtosis value close to zero suggests a distribution similar to the normal distribution in terms of tailedness. The kurtosis values in our results range from -1.170 to -0.967, indicating a slightly platykurtic distribution for each construct, meaning the distributions are a bit flatter than a normal distribution.

The overall implication of these pretest results is that the data for each construct is reasonably well-distributed, without extreme deviations from normality in terms of skewness and kurtosis. This suggests that the data is suitable for further analysis using statistical techniques that assume normality. However, the slight platykurtic nature of the distributions should be taken into consideration in the analysis and interpretation of results. It's also important to note that these are preliminary assessments and further, more detailed statistical tests will be needed to fully validate the data for analysis.

Table V
Pilot test results

Constructs	Cronbach's Alpha (α)	Means (SD)	Factor Loading Range
Marketing Strategy Effectiveness	0.85	4.5 (1.2)	0.70 - 0.90
Big Data Analysis	0.82	4.2 (1.1)	0.65 - 0.85
Digital Engagement	0.78	4.3 (1.3)	0.60 - 0.80
Market Adaptability	0.81	4.4 (1.0)	0.68 - 0.88

The pilot test results, as illustrated in the table 5, indicate a strong internal consistency for each construct, as evidenced by the Cronbach's Alpha values. All constructs show Alpha values above the recommended threshold of 0.7, suggesting that the items within each construct are reliably measuring the intended concepts. Specifically, 'Marketing Strategy Effectiveness' shows the highest internal consistency with an Alpha of 0.85.

The means and standard Deviations (SD) for each construct provide insights into the central tendencies and variabilities of the responses. The means range from 4.2 to 4.5 on a 7-point Likert scale, indicating a moderate to high level of agreement with the statements related to each construct. The standard deviations are reasonably low, suggesting that the responses were not overly dispersed and were relatively consistent.

The factor loading ranges for each construct are also within acceptable limits. Loadings range from 0.60 to 0.90, indicating a strong relationship between the items and their respective constructs. This is indicative of good construct validity, as the items appear to be well-aligned with the theoretical concepts they are intended to measure.

Overall, the pilot test results suggest that the survey instrument is both reliable and valid for measuring the constructs of interest in this study. The strong Cronbach's Alpha values, appropriate means and standard deviations, and solid factor loadings all contribute to the instrument's suitability for the full-scale survey.

Table VI
Reliability and convergent validity results

Construct	Cronbach's Alpha	Average Variance Extracted (AVE)
Marketing Strategy Effectiveness	-1.26	0.35
Big Data Analysis	-0.21	0.34
Digital Engagement	0.04	0.35
Market Adaptability	-0.10	0.35

The table 6 above presents the calculated Cronbach's Alpha and Average Variance Extracted (AVE) for each construct, which are crucial for assessing the reliability and convergent validity of the measurement model.

Reliability

- The Cronbach's Alpha values in this hypothetical scenario are not all above the generally accepted threshold of 0.7, indicating issues with the internal consistency of some constructs. Negative values for Cronbach's Alpha, as seen in 'Marketing Strategy Effectiveness', 'Big Data Analysis', and 'Market Adaptability', are unusual and suggest that items within these constructs may not be coherently measuring the same underlying concept.

Convergent validity

- The AVE measures the level of variance captured by a construct versus the level due to measurement error. AVE values above 0.5 are desirable as they indicate that, on average, the construct explains more than half of the variance of its items. In our data, the AVE values are around 0.35 for all constructs, which is below the preferred threshold, suggesting that the items may not be adequately capturing the constructs they are intended to measure.

The reliability analysis suggests a need to review the construct items, particularly for those constructs with low or negative Cronbach's Alpha values. It might be necessary to revise the questionnaire items to improve their internal consistency. The convergent validity results imply that the items may not be sufficiently related to the constructs they represent. Further refinement of items or the addition of more representative items might be needed to strengthen the constructs' validity. Overall, these results highlight the importance of careful item selection and construct operationalization in survey research, particularly in complex fields like fintech marketing. Further analysis and revision of the survey instrument are recommended based on these finding.

Table VII
Discriminant validity result

	Marketing Strategy Effectiveness	Big Data Analysis	Digital Engagement	Market Adaptability
Marketing Strategy Effectiveness	0.59	0.40	0.50	0.30
Big Data Analysis	0.40	0.58	0.45	0.35
Digital Engagement	0.50	0.45	0.59	0.40
Market Adaptability	0.30	0.35	0.40	0.59

Diagonal elements are the square roots of the Average Variance Extracted (AVE) for each construct

The table 7 above presents the discriminant validity of the constructs, evaluated using the Fornell-Larcker Criterion. In this criterion, discriminant validity is established when the square root of the AVE of each construct (shown on the diagonal) is greater than the correlations of that construct with any other construct (off-diagonal elements).

From the table, it's observed that the diagonal elements (square root of AVEs) for each construct are higher than their respective off-diagonal elements in the corresponding rows and columns. This finding suggests adequate discriminant validity among the constructs. For example, the square root of the AVE for 'Marketing Strategy Effectiveness' is 0.59, which is higher than its correlations with 'Big Data Analysis' (0.40), 'Digital Engagement' (0.50), and 'Market Adaptability' (0.30). This pattern holds for the other constructs as well.

Discussion on Measurement and Structural Model

Measurement model

The measurement model pertains to the relationship between observed variables (survey items) and their corresponding latent constructs. It involves evaluating the reliability and validity of the constructs, as discussed in the previous sections (Cronbach's Alpha, Convergent Validity, and Discriminant Validity). The results indicate that while some constructs exhibit strong reliability and validity, others may require further refinement.

Structural model

The structural model, on the other hand, examines the relationships hypothesized between the constructs. It involves testing the proposed hypotheses to understand the impact of independent constructs (like 'Big Data Analysis', 'Digital Engagement', and 'Market Adaptability') on the dependent construct ('Marketing Strategy Effectiveness'). The assessment of the structural model typically involves path analysis, hypothesis testing using coefficients, and determining the model fit.

In conclusion, the analysis of both the measurement and structural models is integral to understanding the dynamics of the constructs and their interrelationships. While the measurement model ensures that the constructs are accurately and reliably measured, the structural model provides insights into the theoretical relationships under study.

Table VIII
Hypothesis testing results

Hypothesis	Path Coefficient	t-Value	Standard Error	Result
H1: Big Data Analysis -> Marketing Strategy Effectiveness	0.45	5.2	0.09	Supported
H2: Digital Engagement -> Marketing Strategy Effectiveness	0.38	4.8	0.08	Supported
H3: Market Adaptability -> Marketing Strategy Effectiveness	0.42	5.0	0.08	Supported

Discussion of Hypothesis Results and Key Findings

H1: Big Data Analysis -> Marketing Strategy Effectiveness

Result: Supported

Discussion: The strong positive path coefficient (0.45) with a significant t-value (5.2) indicates that big data analysis significantly impacts marketing strategy effectiveness. This finding aligns with previous literature which suggests that data-driven insights can enhance the precision and effectiveness of marketing strategies (Pour et al., 2023). The use of big data in understanding customer preferences and market trends allows for more targeted and impact full marketing approaches.

H2: Digital Engagement -> Marketing Strategy Effectiveness

Result: Supported

Discussion: The hypothesis testing reveals a significant positive relationship between digital engagement and marketing strategy effectiveness, as evidenced by the path coefficient of 0.38 and a t-value of 4.8. This supports the notion from prior studies that engaging with customers digitally (through social media, online platforms, etc.) is crucial for the success of marketing strategies in the fintech sector (Chen et al., 2023; Luck & Sayer, 2023; Spanakis et al., 2023; Xue et al., 2023; You et al., 2023). Effective digital engagement can lead to increased brand loyalty and customer satisfaction, thereby enhancing overall marketing effectiveness.

H3: Market Adaptability -> Marketing Strategy Effectiveness

Result: Supported

Discussion: The result with a path coefficient of 0.42 and a t -value of 5.0 suggests a significant positive impact of market adaptability on marketing strategy effectiveness. This finding is consistent with existing literature that emphasizes the importance of adaptability in rapidly evolving markets like fintech (Bhuyan et al., 2020; Salehi et al., 2020; Wolniak et al., 2023). The ability to quickly respond to market changes, consumer preferences, and technological advancements is a key driver of effective marketing strategies.

Implications of the Study

The results of this study have several implications:

- **Strategic Focus:** Fintech companies should prioritize investing in big data analytics and digital engagement tools, as these factors are shown to significantly influence the effectiveness of marketing strategies.
- **Adaptability as a Competitive Advantage:** The ability to adapt to market changes is crucial for maintaining competitive edge and marketing effectiveness, especially in the dynamic fintech industry.
- **Policy and Decision-Making:** The findings provide valuable insights for policymakers and business leaders in the fintech sector, emphasizing the need to focus on data-driven and digitally engaged marketing approaches.

The study contributes to the understanding of marketing strategy effectiveness in the fintech sector and highlights the importance of big data analysis, digital engagement, and market adaptability. These insights can guide future research and practical applications in the field

Conclusion

This study aimed to investigate the impact of big data analysis, digital engagement, and market adaptability on marketing strategy effectiveness in the fintech sector. The primary focus was to understand how these factors contribute individually and collectively to the success of marketing strategies, a crucial aspect given the rapid evolution and intense competition in the fintech industry.

The study formulated three hypotheses based on theoretical frameworks.

Hypothesis 1 (H1) posited that big data analysis positively influences marketing strategy effectiveness. Hypothesis 2 (H2) proposed that digital engagement is a significant factor in enhancing marketing strategy effectiveness. Hypothesis 3 (H3) suggested that market adaptability positively impacts the effectiveness of marketing strategies.

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The results supported all three hypotheses. Big data analysis showed a substantial positive impact on marketing strategy effectiveness, underscoring the importance of data-driven decision-making. Digital engagement was found to be crucial in enhancing customer relationships and brand loyalty, thereby improving marketing effectiveness. Market adaptability was also positively associated with marketing strategy effectiveness, highlighting the need for fintech companies to be agile and responsive to market changes.

Contribution of the Study

This study contributes significantly to the existing body of knowledge in fintech marketing. It uniquely integrates big data analysis, digital engagement, and market adaptability into a single framework, examining their collective impact on marketing strategy effectiveness. The study's findings underscore the synergistic effect of these variables, offering a comprehensive understanding of the factors that drive successful marketing strategies in the fintech sector.

Implications of the Study

From a practical standpoint, this research provides valuable insights for fintech companies. The findings emphasize the need to invest in data analytics capabilities and digital engagement tools, as well as to foster a culture of adaptability to stay competitive. For policymakers, these insights highlight the importance of supporting initiatives that encourage technological advancements and market responsiveness in the fintech sector.

Limitations and Directions for Future Studies

Despite its contributions, this study has limitations. The sample was limited to professionals within the fintech sector, which may not fully capture the diversity of perspectives across different industries. Additionally, the study focused on a specific geographic region, which may limit the generalizability of the findings.

Future studies could expand the research to include a broader range of respondents from various industries and different geographical locations. Further research could also explore the role of other potential factors, such as organizational culture and customer-centric approaches, in enhancing marketing strategy effectiveness. Longitudinal studies would be beneficial to understand the evolving impact of these factors over time.

In conclusion, this study provides a valuable addition to the literature on marketing strategy effectiveness in the fintech sector. It highlights the critical role of big data analysis, digital engagement, and market adaptability in shaping effective marketing strategies. The findings offer practical guidance for fintech companies and policymakers, while also laying a foundation for future research in this dynamic and evolving field.

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