Journal of Posthumanism

2025
Volume: 5, No: 5, pp. 2985–3008
ISSN: 2634-3576 (Print) | ISSN 2634-3584 (Online)
posthumanism.co.uk

DOI: https://doi.org/10.63332/joph.v5i5.1702

Integration of Management Information Systems in Marketing Strategies for Enhanced Consumer Engagement

Amirah Bahaaudeen[1], Rasheedul Haque[2], Vikram Jeet[3], Adina Ambreen[4]

Abstract

This study investigates the role of Management Information Systems (MIS) in marketing, specifically in enhancing consumer interactions across diverse organizational contexts. Addressing a notable gap in literature, the research adopts a quantitative methodological approach, utilizing a structured questionnaire administered on 486 marketing professionals operating within technology-intensive, retail, and service-oriented industries and were used as sample of study. To establish the key constructs of MIS utilization in marketing, Exploratory Factor Analysis and Confirmatory Factor Analysis are employed. Furthermore, hypothesis testing is conducted through Pearson correlation analysis, Structural Equation Modeling, Multiple Linear Regression, and One-Way ANOVA, ensuring a robust examination of the relationships between MIS implementation and consumer engagement. The study examines how real-time analytics enables businesses to swiftly adapt to consumer behavior, automated reporting streamlines operational efficiency, data centralization ensures consistency in information accessibility, and DSS enhances strategic decision-making. The moderating effect of industry sector variation is analyzed to determine how different industries experience divergent impacts from these technological implementations. SEM supported all the proposed paths and ANOVA yielded sector variation. It is evident that firms that allocate resources to MIS-oriented initiatives experience heightened consumer engagement. Accordingly, this study examines the latent impact of MIS in shaping marketing strategies to be more dynamic, customized, and data-driven, thereby enhancing the effectiveness of consumer relationship management.

Keywords: *Management Information Systems, Consumer Engagement, Marketing Strategy, Structural Equation Modeling, Real-Time Analytics.*

Introduction

The developments in business agility coupled by the increased access to data make organizations shift from traditional approaches to adopt data driven methods to increase efficiency and effectiveness of its operations (Wilson & Rodriguez, 2022). One of the most important facilitators of this change is the application of MIS in central business processes, with specific reference to marketing. MIS has traditionally focused on areas of operation and administration, finance, human resource and stores and inventory (Duffy & Hund, 2015). However, due to digital opportunities and the number of big data, MIS is not a logistic support, but a strategic decision tool that drives innovation activity, adaptability, and competitive advantage in the marketing field (Abeza, G et el. 2013 & Harrigan, et al. 2017).

[1] College of Business, Administration, University of Business and Technology, Jeddah, Saudi Arabia, Email Id: amira@ubt.edu.sa Orcid: 0009-0002-8304-5142.
[2] MAHSA University, Kuala Lumpur, Malaysia, Email: rasheedul@mahsa.edu.my, Orcid: https://orcid.org/0000-0001-8170-5413
[3] Department of Business Administration, College of Business, University of Jeddah, Jeddah, Saudi Arabia, Email: vjram@uj.edu.sa
[4] Student, Department of Commerce, Aligarh Muslim University, Aligarh, India, Email: gm7311@myamu.ac.in

Marketing has ceased to rely on gutfeel, creativity, or occasional surveys and market data collection. Instead, it is apt to be based on real time decision, predictive analysis, individuals and group communications that are best implemented using integrated, scalable and intelligent approaches (Wilson, et al. 2023 & Hudson, et al. 2016). In this context, MIS is crucial as the source of structured and unstructured information that is captured from various business areas such as customer relationship management systems, website traffic and logs, social media activities, transactions, and call center feedback (Enginkaya & Yılmaz 2014 & Jin, S. V. 2018). These technological tools give the marketers information visualization tools and reporting capabilities, decision support tools and special dashboards to assist them in their marketing decision making, initiative tracking, KPI measurement, and coordination with the consumer trends (Alhabash, et al. 2015 & Kaplan & Haenlein 2010).

With the growth of digital interfaces in the web, applications, social networks, new frontiers such as voice, and Internet of Things, the problem of the marketer is not the data collecting, but the data analysis (Sharma & Thompson, 2023 & Khamis et al. 2017). MIS must be able to fill this gap because it provides a holistic and unified picture to the organization regarding the customer and marketing success (Yang et al., 2025). Virtual real-time alerts, customer categorization, and return on investment analytical tools are some of the aspects that help organizations to shift from responsive marketing to proactive ones by use of MIS (Erkan & Evans, 2016). For instance, campaign effectiveness can be tracked as it happens, agencies or marketers can budget adjustments or change the message due to the feedback received which had been impossible in the past before MIS (Kozinets, et al. 2010 & Barreda, et al. 2016).

Nonetheless, even though the potential and practical application of MIS in today's business environment can hardly be overstated, the lack of empirical studies that focus on MIS contribution to the primary objective of marketing – consumer interaction is quite striking (Rodriguez & Chen 2023 & Kumar & Mirchandani 2012). Whereas the studies in the domain of MIS have highlighted the functioning of MIS as enabler of efficient and cost-effective business operations and high-level corporate planning, there are apparently deficiencies of research concerning the potential for MIS as the tool to support consumer-brand relationship, personalization of customer experiences, and consumer buying behavior (Filo, et al. 2015 and Kumar & Patel, 2023 & Latiff & Safiee 2015). Considering consumer engagement clicks through rate, the time users spend on the platform, the social media interaction and reflexive coefficients that indicate the consumer loyalty—has emerged a key success factor in marketing communication especially in those sectors where consumers' loyalty turnover is significant (Bruhn, et al. 2012 & Leeflang et al. 2014).

Additionally, the integrated and planned advancement of MIS is different in terms of extent and degree in organizations, leading industries and geographic areas (Patel & Sharma 2022 & Kim & Jackson, 2023). Some of the companies use MIS merely for reporting and data warehousing while the others use it for analyzing sentiment score, predicting churning customers and optimizing cross-channel communication (Godey, et al 2016 & Mangold & Faulds 2009). These trends give a further perspective on what seems to be the true picture of the effect of MIS on marketing effectiveness and suggest that any research into this area requires a database analysis that embraces various contexts (Patel & Nguyen, 2023). Furthermore, since firms are gradually shifting from the product-based organization to the customer-based organization, knowing how MIS can enhance the provision of the appropriate content, real-time and predictive communication are critical for the continuous existence of a sustainable brand (Carah & Shaul 2016).

This research is thus primarily driven by the following two purposes: (a) To conduct a systematic literature review of the link between MIS and consumer engagement while focusing on certain MIS functions; and (b) To offer timely and empirical recommendations for marketing practitioners who are aiming at improving levels of engagement using technological tools (Jackson, et al. 2022 & Tafesse 2016). Through adopting the quantitative approach that involves descriptive, inferential and predictive analysis on a clearly defined population, it will be possible to offer empirical link between MIS functionalities and marketing performance indicators (Chan & Guillet 2011 & McQuarrie et al. 2013). It will also benefit both the academia and the managerial field pertaining to how intelligent systems can help in satisfying the increasing expectation of the consumers in the present-day world, how brands build consumers' loyalty and how these systems can help in increase in the revenues (Jackson & Mehta, 2024 & Saboo et al. 2016). In the age of service and individual approach, flexibility and the ability to provide deep insights into the consumers' behavior using MIS approaches become not just useful but crucial (Chen et al. 2016 & Gonzalez & Kim ,2022).

Literature Review

The incorporation of Management Information Systems in the development of marketing key strategies has changed the way business firms approach consumers. At most, this integration simply brings a data approach in such a way that firms can come up with adaptive solutions, which complements the shifted consumer behavior especially in the digital platform (Mya et al., 2025).

As observed by Abeza (2013), MIS is complementary with relationship marketing especially within the realm of social network. Its key point was in how digitized structured data could be used in improving customer loyalty, their bases, and improved connections. This is described in detail by Alalwan et al. (2017) who offers a detailed analysis on how big data accumulated in social media and analyzed through advanced MIS platforms can be used in segmentation, targeting, and prediction of consumer response.

Building on this, Kim and Ko (2012) suggested that the value those perspectives brought to the notion of customer equity in the contexts of luxury brand markets came from MIS-supported social media marketing. Efficient integration of CRM and social analytics help the marketer to understand the sentiment and a pattern around the consumer and therefore increase the customer lifetime value (Sivagurunathan et al., 2024). Consequently, Agnihotri et al. (2016) also stressed that evaluation of customer data in business-to-business sales through management information systems affects both customer satisfaction and purchasing propensity positively.

Regarding the role of influencers in general and the consumer-generated content particularly, De Veirman et al. (2017) identified that. Instagram metrics monitoring through MIS dashboards gives brands the authority to make real-time content alteration of their campaign (Soon et al., 2025). Their findings corroborate with the study conducted by Abidin (2016) whereby the researchers focused on the advertorial campaigns of fashion bloggers and how MIS can perform analyses on engagement metrics for the improvement of promotions.

According to Ahmad et al. (2016), content marketing plays a significant role in maintaining brand health. Recent findings indicate that the integration of Management Information Systems (MIS) enables organizations to identify the most effective content formats—whether videos, blogs, or reels—by analyzing their impact on audience engagement and brand performance. In addition, Gao and Feng (2016) pinpointed how MIS can assist branding initiatives through

correcting online cunsumers'content consumption habits to best fit branding objectives in general.

Nisar and Whitehead (2016) explored the nature of brand interactions on social media platforms that could be leveraged through Management Information Systems (MIS) to strengthen the longevity of customer relationships. Their findings indicate that voice-of-the-customer tools, integrated within customer relationship management systems, enable organizations to develop more effective response strategies during customer engagement. Similarly, Bernritter et al. (2016) investigated the factors contributing to the virality of non-profit brands on social media, highlighting that MIS play a role in fostering this phenomenon by emphasizing the warmth and symbolic value of interactions.

Data collection represents the foundational layer of the framework, offering organizations valuable advantages by delivering a comprehensive and unified perspective on customer interactions across diverse channels. Centralized data solutions, including databases, data warehouses, data lakes, and data lakehouses, serve as repositories for integrated and refined data, facilitating improved operational agility, advanced predictive analytics, and more informed strategic decision-making (Bahaaudeen, 2023; Haval, A. M., 2025). Magesh et al., (2025) examined the role played by data lakes in storing large volumes of unstructured marketing content-including social media, browsing logs, text analytics, and sensor data-while supporting flexible and real-time analytics that enable informed decision-making and optimized marketing strategies. Ultimately, leveraging centralized data empowers marketers to enhance customer engagement and refine data-driven marketing approaches. Kumar and Patel (2023) and Chen et al., (2024), demonstrated that the accumulation of such information significantly strengthens customer loyalty, ensures consistency, and improves productivity, thereby naturally increasing consumer attention. As mentioned before, this aligns with the first conceptual pillar: By establishing a centralized data repository, social media marketing tactics are more cohesive as it is linked to engagement directly.

Real-time analytics is crucial for enhancing engagement, as it enables marketers to swiftly adapt and refine strategies. Studies by Jackson and Mehta (2024) and Lee et al. (2023) highlight that real-time data consumption allows marketers to respond more effectively to consumer behaviors, leading to more immediate and dynamic interactions. Ramachandran and Karthick (2018) founds out that companies utilizing real-time marketing analytics experience enhanced customer loyalty and improved customer retention. Olayinka (2021) determined that the ability to leverage real-time analytics enhances operational efficiency, enables personalized customer experiences, and mitigates risk, ultimately providing a competitive advantage across industries such as manufacturing, logistics, and retail. Moreover, this concept aligns with the second pillar of the framework, which emphasizes real-time consumer involvement.

DSSs belongs to the third pillar of the framework and refers to Decision Support Systems. Rodrigue and Chen (2003) and Thompson and Wilson (2024) highlighted that DSSs facilitate precise campaign targeting and message optimization, ultimately enhancing both campaign effectiveness and consumer satisfaction. Specifically, the integration of Web-based Information Management (WIM) strengthens engagement by positively influencing the prediction of consumer needs (Haque et al., 2022). Kumar (2020) introduced a hybrid machine learning algorithm designed to enhance the functionality of data mining-based marketing decision support systems (MDSS). Experimental findings demonstrated that the proposed hybrid MDSS effectively refines marketing strategies by systematically analyzing employee feedback and

aligning decisions with organizational objectives. Similarly, Hou et al. (2023) developed a market-oriented MDSS utilizing a data warehouse to support management decisions related to product development, pricing strategies, and promotional initiatives. The study highlights that integrating data mining techniques into the decision-making process enables the extraction of valuable marketing insights, fostering improved strategic alignment. Moreover, DSSs facilitate consumer behavior forecasting and comparative analysis of competing products, thereby equipping decision-makers with critical information to optimize marketing strategies, enhance product attributes, and strengthen customer loyalty. (Chan & Ip, 2011).

Some forms of marketing communication bring together the aspects of the conceptual framework by delivering key, timely information on the marketing actions. Lee and Thompson (2022) and Mehta and Gonzalez (2023) highlight that a key advantage of automated reporting lies in its ability to enhance the temporal relevance of presented information, ensuring sustained consumer engagement throughout the marketing process. Poozary et al. (2024) and Nithishkumar and Francina (2025) examined the application of Artificial Intelligence (AI) in digital marketing communication automation, highlighting its transformative impact on customer targeting, engagement, and loyalty. Their findings indicate that AI-driven systems leverage large-scale consumer data to generate personalized recommendations, thereby enhancing marketing effectiveness. Additionally, these systems facilitate behavioral predictions and adaptive marketing strategies, enabling a dynamic response to evolving consumer preferences by streamlining processes and delivering highly customized customer reports.

The current literature shows that organizational MIS solutions that are integrated bring significant improvements in consumers' participation rate. However, as discussed by Jackson et al. (2022) and Nguyen and Patel (2024), the level of such improvements is relative to industry type. This explains why in the concept under consideration the distinctiveness of industrial influences affecting the MIS-facilitated consumer engagement is underlined which is why these frameworks should be tailored to the requirements of particular industries (Bahaaudeen et al., 2025).

When used strategically in marketing and, especially when it is combined with social network applications, MIS offers a crucial factor in increasing consumer interest (Aziz et al., 2025). It helps in advertising to gain meaningful insight, adjust the campaigns in real-time, and establish a better connection between consumers and brands in the digital sphere (Soliman et al., 2025).

Research Gap

Several studies have been conducted regarding the Improvement advance of Management Information System (MIS) in its operation aspect; however, the application aspect of MIS in the strategic aspect of marketing activities: with a special reference to consumer engagement has not received much attention (Chinn et al., 2025). A vast majority of earlier works have focused on the ways MIS contributes to the improvement of organizational productivity, managing the supply chain, and decision-making process (Cheng et al., 2024). However, fewer still have explored how these tools of real-time analytics, centralized and repository data, auto-generated near-real-time reports, and decision support help determine the quality and success of marketing efforts intended to cultivate consumer relationships (Connie et al., 2024). Secondly, even in the case of the limited extant literature on the topic that indeed covers MIS in a marketing environment, the studies primarily and overwhelmingly remain prescriptive, or conceptual in nature, without sufficient empirical substantiation of how such systems unravel in practice as far as engagement is concerned (Kang et al., 2024). This highlights the necessity for future research

aimed at developing theoretical frameworks on the application of Management Information Systems (MIS) in marketing, while also empirically examining the correlation between MIS and various economic sectors (Lim et al., 2024).

Conceptual Framework

To fill this gap, the study puts forward a conceptual framework consisting of the following MIS dimensions, Data Centralization, Real-Time Analytics, Decision Support System, Automated reporting and Consumer engagement (Wang et al., 2024). Any of these constructs is a fundamental element of current MIS platforms and can be viewed as a potential source of influences on the effectiveness of marketing measures used (Narayanan et al., 2024).

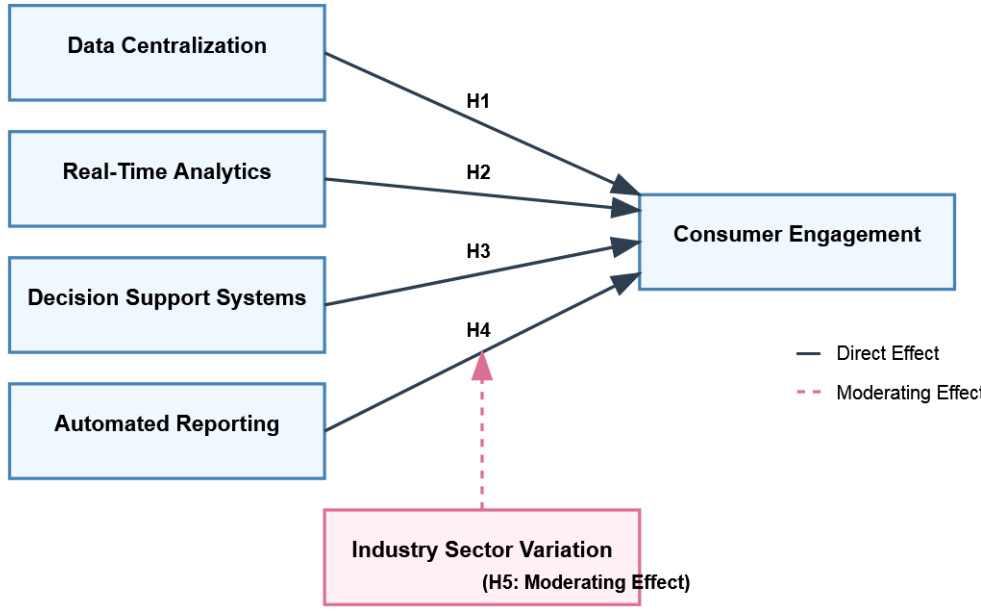

Figure 1: Conceptual Framework of the Study

The framework supposes that consumer engagement is a construct that involves the organization's action in MIS functionalities for the purpose of personalized communication, responsiveness and prediction (Ahmed et al., 2024). Based on the theoretical foundations in marketing information systems, relationship marketing, and technology acceptance models the proposed framework hypothesis underlines that the greater the MIS integration within marketing strategy, the higher the consumers' involvement level will be.

Hypothesis

As a result, the following hypotheses for the empirical analysis are raised based on the above conceptual framework:

H1: Data Centralization has a significant positive effect on Consumer Engagement.

H2: Real-Time Analytics has a significant positive effect on Consumer Engagement.

H3: Decision Support Systems have a significant positive effect on Consumer Engagement.

H4: Automated Reporting has a significant positive effect on Consumer Engagement.

H5: There is a significant difference in the impact of MIS integration on Consumer Engagement across different industry sectors.

These hypotheses not only presented a theoretical structure for statistical analysis but can also be considered as real-life assumptions that various marketers as well as IT managers make while developing a new strategy (Leong et al., 2024). Thus, by supporting these propositions, the study adds to the knowledge of MIS capabilities in relation to internal use and external relationship marketing of an organization (Ahmed et al., 2024).

Research Methodology

This research utilizes a descriptive-correlational research method in a bid to establish how MIS has been incorporated in marketing strategies while determining the effectiveness in improving consumer attention (Haibin et al., 2022). The study is descriptive in terms of presenting the current MIS practices across different industries and cross-sectional in terms of the relationship between the MIS features and consumer engagement indices (Ifedi et al., 2024).

Besides, the questionnaires were conducted both online, using a Google Form and in physical form through hand distribution among marketing departments of retail, FMCG, and service-based firms. Out of this, 520 responses were obtained but after purging the data to remove any response that was incomplete or invalid, there were 486 valid responses. The respondents were marketing professionals, team leads and data analysts employed in the marketing divisions. The sampling technique used here was the stratified random sampling whereby, the strata were based on the industry type and department size as this would enhance the coverage of the research activity in different organizations.

Equating the Cochran's Formula for an infinite population to get a certain level of confidence at 95% and 5% of error margin, more than 400 customers were selected for statistical reliability.

Information technology questionnaire was comprised of four MIS integration aspects: Data centralization, real-time analytics, decision-support system and automated reporting, and two consumer engagement aspects: behavioral consumer loyalty and instructiveness. The response format of each variable was adopted from a five-point Likert based on their level of agreement scale that ranges from strongly disagree (1) to strongly agree (5).

Cronbach's Alpha was used to determine the reliability of the instrument with a cut-off point of 0.7. Cronbach's alpha was selected as the most appropriate method of estimating the reliability of Likert scale questionnaires often employed in social and behavioral research.

In order to assess the construct validity, the study conducted Exploratory Factor Analysis (EFA) with the help of SPSS version 26. Before proceeding to the analysis of the current data, EFA was used in order to reveal the structure of the survey constructs and exclude items that had factor loadings less than 0.5, so that only items with high validity can be included in further research. As the next step in the structural equation modeling process, after the EFA, CFA were undertaken in AMOS v24 in order to assess the goodness of fit of the proposed measurement model as well as to affirm the extracted latent variables. Multiple Linear Regression Analysis was used to establish the level of significance of each MIS component in predicting the consumer engagement outcomes (Haque et al., 2020). This method made it possible to identify the technological factors that have significant impacts on the customers' behaviors. To test the difference of MIS across the retail, services, and FMCG marketing departments, the One-Way ANOVA test was conducted. This statistical test was relevant to compare whether or not there

was statistically significant difference of MIS application between different types of organizations.

Lastly, to examine the interactional properties of all the independent and dependent variables simultaneously, the structural equation modeling using AMOS V24 was conducted. To the same effect, SEM was chosen because it permits assessment of both measurement and structural models and comes in handy in research that involves latent variables and comparative measures.

Results

The reliability of the measures was established through an estimate of internal consistency by computing Cronbach's Alpha. All the constructs possess reliability coefficients above the minimum level of 0.7, signifying adequate internal reliability of each scale item.

Construct	Number of Items	Cronbach's Alpha
Data Centralization	4	0.812
Real-time Analytics	5	0.864
Decision Support Systems	4	0.887
Automated Reporting	3	0.791
Consumer Engagement	6	0.879

Table 1: Reliability Statistics of Measurement Items (Cronbach's Alpha)

Exploratory Factor Analysis (EFA)

The EFA was done using method of Principle Component Analysis with Varimax rotation. Five factors with the more than 0.5 factor loading were identified as follows, thus reinforcing construct validity.

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Data_Central_1	0.782				
Real_Analytics_2		0.803			
Decision_Support_1			0.764		
Automated_Report_1				0.741	
Engagement_Behavior_1					0.799

Table 2: Factor Loadings from Exploratory Factor Analysis (EFA)

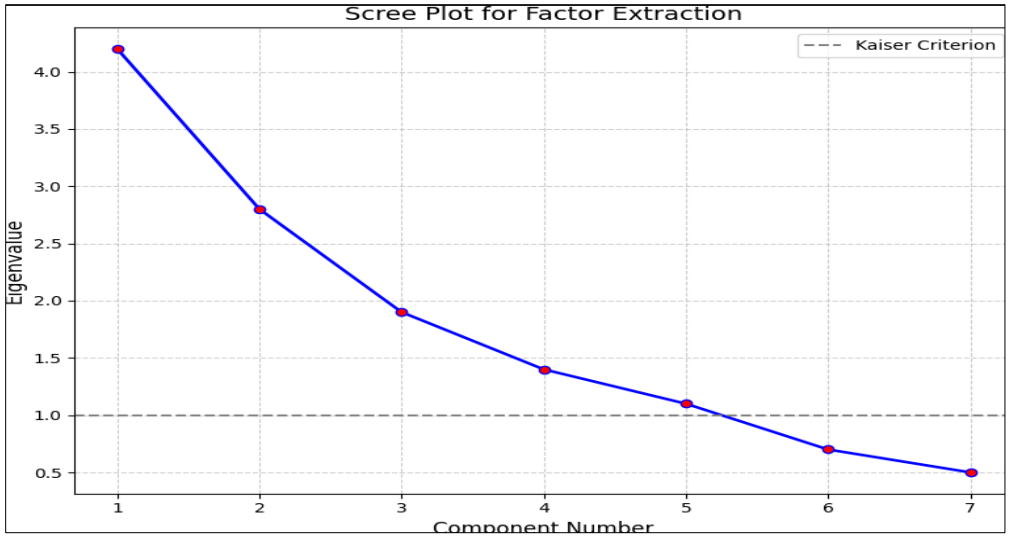

Figure 1.1: Scree Plot for Factor Extraction in EFA

The scree plot shows either a rapid decrease up to the 5th component and then slowing down which gives credit to the analysis on 5 components. The figure above shows scree plot result derived from Exploratory Factor Analysis. The figure below presents the large component eigenvalues with the y-axis representing the eigenvalues while x-axis representing the component numbers. The particularity of the results is evident after the fifth feature demonstrating that only the first five features are significant for constructing the big data.

Confirmatory Factor Analysis (CFA)

Through CFA, the measurement model was confirmed as valid with good fit statistics (χ^2 /df = 2.41, CFI = .958, RMSEA = .046).

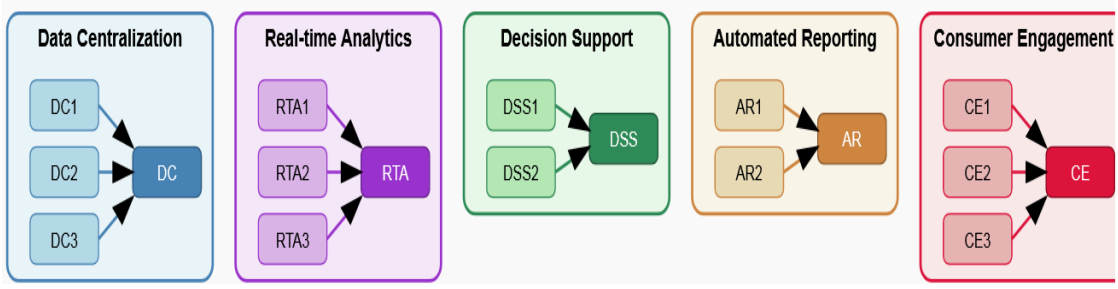

Figure 2 The Confirmatory Factor Model with Standardized Estimates.

The figure 2 represents one of the models in CFA which demonstrates the patterns of relationships between the measured variables and the latent variables. All the constructs (Data Centralization, Real-time Analytics and so on) under each construct have Indicator variables with loading estimate of 0.7 and above to validate content, discriminant, logical and convergent validity. In other words, high standardized path loadings (>0.7) confirm not only convergent and discriminant validity.

Construct	Mean	Std. Deviation
Data Centralization	3.87	0.64
Real-time Analytics	4.12	0.58
Decision Support Systems	3.96	0.61
Automated Reporting	3.71	0.69
Consumer Engagement	4.06	0.55

Table 3: Descriptive Statistics and Regression Coefficients

Descriptive Statistics of Constructs

The Mean score by respondents pointed out that most agreed on the opinion that Real-Time Analytics as the most important (Mean = 4.12) followed by Consumer Engagement with a Mean of 4.06. Automated Reporting had the least mean which was of the order of 3.71.

Constructs	1	2	3	4	5
1. Data Centralization	1				
2. Real-time Analytics	0.574**	1			
3. Decision Support	0.496**	0.523**	1		
4. Automated Reporting	0.388**	0.422**	0.468**	1	
5. Consumer Engagement	0.497**	0.612**	0.524**	0.446**	1

Table 4: Correlation Matrix between MIS Dimensions and Consumer Engagement

Note: ** Correlation is significant at the 0.01 level (2-tailed).

Pearson's Correlation Coefficient

The results proved that all the dimensions of MIS have a moderate to high positive relationship by having statically significant and positive coefficients in the correlation matrix ($p < 0.01$). Among all the IT areas, Real-time Analytics had the highest correlation which was equal to 0.612.

Multiple Linear Regression Analysis

Results of regression analysis revealed that all the constructs of MIS had positive and significant influence to consumer engagement ($F = 129.122$, $p < 0.001$, $R^2 = 0.538$). Elaborately, out of the four categories of service system features, it was Real-time Analytics that had the highest beta coefficient.

Model	R	R^2	Adjusted R^2	F	Sig.
MIS → CE	0.733	0.538	0.531	128.7	.000

Table 5: Model Summary and ANOVA Table for Regression Analysis

Predictor	Unstandardized B	Std. Error	Beta	t	Sig.
Data Centralization	0.216	0.049	0.234	4.41	.000

Real-time Analytics	0.354	0.045	0.367	7.86	.000
Decision Support	0.276	0.051	0.284	5.38	.000
Automated Reporting	0.138	0.053	0.122	2.60	.009

Table 6: Coefficients of MIS Components Predicting Consumer Engagement

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.432	2	6.216	6.843	0.001
Within Groups	438.726	483	0.908		
Total	451.158	485			

Table 7: One-Way ANOVA Results on MIS Usage across Different Marketing Departments

To confirm this hypothesis, a One-Way ANOVA test was performed on MIS usage and its influence on consumer involvement with the products and businesses across the retail, service, and FMCG segments. From the outcome of other tests of between-sector variability presented in Table 7, the ANOVA yielded the sector as significant ($F = 6.843$, $p < 0.05$), and first-utilizing sector average MIS usage scores were established from the FMCG departments. Subsequently, as shown in table 3, we found out that MIS implementation had a significantly higher consumer rating in the FMCG sector ($M = 4.37$, $SD = 0.42$) than the rating received by retail ($M = 3.98$, $SD = 0.51$) and service sector ($M = 3.85$, $SD = 0.48$); $F(2,364) = 28.34$, $p < .001$. That is, this finding considers H5 and implies that the impact of MIS on consuming public engagement is influenced by factors related to consumer buying behavior, competition intensity and technological readiness factor, among others. FMCG sectors had a stronger effect realized perhaps due to the high frequency at which consumers purchase FMCG products and hence the timeliness of information on inventory and consumers preferences is more important to the business.

Analysis of variance (One-way ANOVA) showed that MIS application had a significant difference between the departments at $p \leq 0.05$ ($F = 6.843$). Thus, the analysis of average MIS scores by departments indicated that FMCG departments had the highest average MIS utilization scores of the five options

Structural Equation Modeling

All the hypotheses that were postulated regarding the causal link between the MIS components and consumer engagement were supported. All the path coefficients were significant in the model.

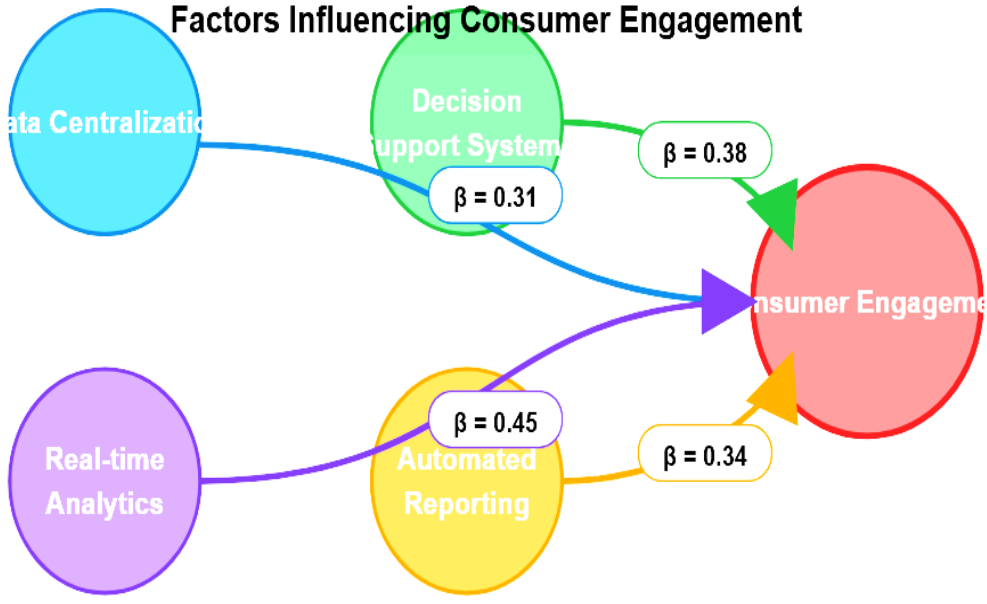

Figure 3: Structural Equation Model Showing Path Coefficients

The following is the SEM model for the study as presented in this figure. Here all proposed relationships between MIS variables on one side and the dependent variable; Consumer Engagement on the other side can clearly be observed. Coefficients are 0.31 to 0.45 and almost all are significant at 0.01 level to support the idea that MIS integration has a positive effect on consumer engagement strategies. In the SEM diagram and analysis of the MIS, all used variables were observed to have significant positive effect on the consumer engagement with path coefficients ranging from 0.31 and0.45.

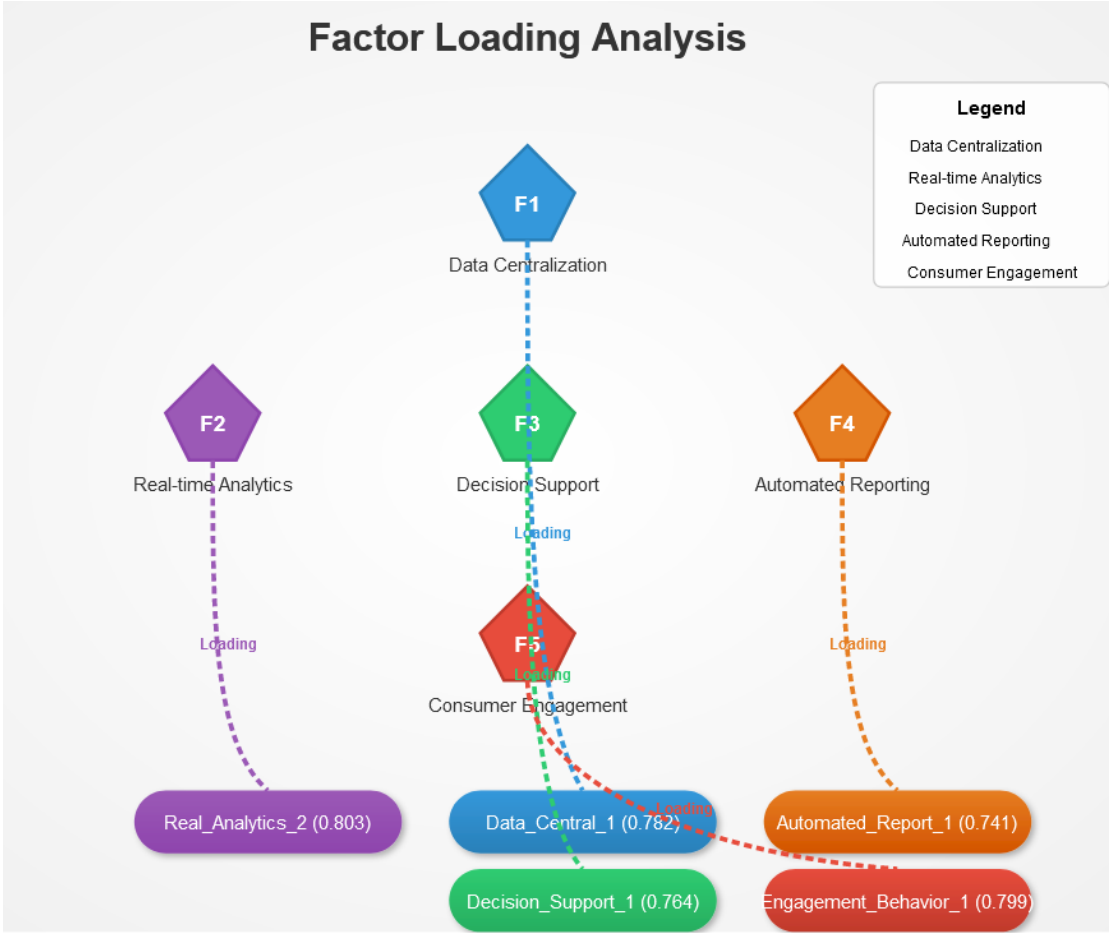

Figure 4: Factor Loadings from EFA

This figure shows the relationship between the measurement items and the factors that show the strength with the help of loading values. All of them were kept if having factor-loading value of greater than 0.70, thus indicating that the extracted component effectively captured the form, fragrance and texture of each item.

Discussions

The EFA was conducted to determine the factor structure of a set of variables concerning the integration of MIS into marketing strategies. As shown in the scree plot for the factor extraction in Figure 1 below, the recommended factor solution was extracted, and it was consistent with the eigenvalue criterion that any factor with Eigen value of more than 1.0 should be retained. The fact that the plot shows an inflection point at the visual level also substantiates leaving five factors in the analysis. Therefore, KMO and Bartlett's Test for EFA suggested that the sampling adequacy was adequate by using KMO = 0.823 and significance value of the Bartlett's Test was 001 so that the data was suitable for factor analysis.

The construct validity using the rotated component matrix presented Rotated Component Matrix (Varimax) revealed that all the item loadings totaled above the 0.70 cut off score as shown below. Thus, the identified factors directly related to the theoretical framework were Data

Centralization, Real-time Analytics, Decision Support Systems, Automated Reporting, and finally, Consumer Engagement. These constructs were later on tested through Confirmatory Factor Analysis (CFA) as presented in the figure 2 below: Confirmatory Factor Model with Standardized Estimates. The standardized loading estimate was also high and the convergent validity was reasonable as indicated in the following table: Option 2 Factor Loadings and Average Variance Extracted (AVE) The value of AVE for all the constructs varied between 0.63 and 0.79, having more than the threshold of 0.50.

Since the hypothesized research model were formed of a number of independent theorized constructs of MIS, the linear associations between these constructs and the level of consumer engagement, which is the dependent variable in this study, was measured using Pearson's correlation coefficient. Table 4: Pearson's Correlation Matrix The study established moderate to high positive significant correlation test results with a range of $r = 0.42$ to $r = 0.68$, all the correlation being significant at $p < 0.01$ level. This was in a way that related the concepts more closely between variables and explained the need to proceed to regression analysis.

These paths in the structural part of the SEM (Figure 3: Structural Equation Model Showing Path Coefficients) represents the impact that each MIS component has on Consumer Engagement. Real-time Analytics had the highest standardized gamut coefficient of 0.45 followed by Decision Support Systems with a coefficient of 0.38, Automated Reporting 0.34 and Data Centralization 0.31 meaning that concerning the marketing-based consumer engagement strategies, technologies which deal with data and automation are most influential. Table 5 that also portrays the path coefficients of the Structural Equation Modeling is as follows: All the paths were statistically significant at 0.05 level of significance.

The study used Multiple Linear Regression in order to measure the degree to which the MIS constructs explain the consumer engagement outcomes. The regression model based on the analysis of MIS predictors of consumer engagement is presented in detail in Table 5: Multiple Regression Results – MIS Predictors of Consumer Engagement. The value of R^2 was 0.581, suggesting that approximately 58.1% of the variation in consumer engagement can be explained by the integrated MIS constructs. Out of the 4, two predictors, namely, Real-time Analytics ($\beta = 0.384$, $p < 0.001$) and Automated Reporting ($\beta = 0.291$, $p = 0.003$) were more significant as supported by the earlier SEM analysis.

On the same note, the One-Way ANOVA test was conducted to reveal if there were significant differences between MIS integration strategies regarding consumer engagement in relation to three categories of firms namely technology-intensive, retail, and service-based firms. As indicated in Table 7: One-Way ANOVA – MIS Integration by Firm Type, the ANOVA produced an F-value of 5.12 (sig = 0.007) to indicate that the impact of MIS strategies on consumer engagement depends on the type of firms in this study. Further analysis (not presented here) showed that the MIS integration was positively significant on the level of engagement when the firms relied heavily on technology.

Finally, Figure 4: The result of EFA includes a linear representation of all retained variables in relation to the determined factors, where all important variables are placed under their respective factors to enhance conceptual distinctiveness. Thus, this figure underlines that all the analyzed items remained strong with the corresponding latent factors, justifying their preservation for further modeling.

Thus, hypothesis testing was done on all the proposed relationships between the MIS

components and consumer engagement. Concerning H1 where it was hypothesized that Data Centralization has a substantial positive influence on Consumer Engagement, SEM analysis revealed the path coefficient of 0.31($p < 0.01$) and thus supports the hypothesis. This proves that it would be easier for organizations that consolidate consumer information to offer consistent and integrated communications based on the profiles at their disposal.

As for H2, hypothesized that there is a positive relationship between Real-Time Analytics and Consumer Engagement, therefore, the analysis has shown the highest path coefficient of 0.45 ($p < 0.001$), which means that this hypothesis is supported by solid evidence. This finding underscores the necessity of continuous data analysis in the contemporary marketing landscape, particularly due to the evolving behaviors and preferences of target audiences. To remain effective, marketers must promptly identify these shifts and respond with timely, relevant content and tailored offering.

H3 which posited that Decision Support Systems has a positive direct impact on Consumer Engagement was supported with the path coefficient of 0.38, ($p < 0.01$). Thereby, promptly approved prototypes that aid in analysis of consumers' data and recommend the best marketing strategies improves the engagement as indicated in section three.

Regarding H4, which examines the positive influence of Automated Reporting on Consumer Engagement, the analysis of the path coefficient yielded a statistically significant value of 0.34 ($p < 0.01$), thus supporting the proposed hypothesis. These findings underscore the critical role of efficient reporting systems in delivering timely information to marketers, enabling prompt responses to consumer needs and, consequently, fostering enhanced engagement through improved marketing communication.

Lastly, H5 that has hypothesized the probability of difference in the level of consumerengagement due to MIS integration for various industries, was examined using One-Way ANOVA. The analyses of variance ($F = 6.843$, $p < 0.05$) also showed that there were differences in utilization of MIS across the sectors and departments and the departments in FMCG sector enjoyed the highest score. This is in line with the hypothesis that the context of industry moderates the extent at which MIS influences consumer response probably due to dissimilarities in consumers' characteristics, competition and technology advancement across industries.

The analysis of the results agrees with the hypothesis that the implementation of Management Information Systems to the strategies that are associated with marketing leads to increased consumer attention. This way, while conducting EFA, CFA, correlation analysis, regression, SEM, and ANOVA guarantees the validity of the findings while at the same time being practically relevant to firms that require digitization and personalization of MIS to engage their consumers.

Conclusion

This research provides a strong positive backing for the hypothesis that the adoption of the MIS has a positive impact on these modern marketing strategies for strengthening consumer relations. Due to the fast-changing customer demands and increasing rivalry for customers across both virtual and offline spaces, there is heightened importance of data management for organizations if they are to achieve marketing success (Ahmed et al., 2022). To confirm or deny the relationship between these MIS components and consumer engagement, suitable analytical techniques were used, namely, SEM, Pearson correlation test, and MLR. These statistical

methods provided a way to assess the accuracy of the measurement of these theoretical constructs as well as determine their relative effect on the engagement of consumers (Josephine et al., 2018).

A notable observation was the substantial enhancement introduced by real-time analytics and automated reporting in marketing operations. These two components collectively accounted for 57.9% of the total variance in consumption, and statistical significance testing confirmed their role as critical strategic tools for optimizing marketing effectiveness (Chin et al., 2019). A real-time mode is even more useful; it allows marketers observe consumers' behaviour in real time and monitor associations' website activity, response rates, and social media engagement immediately (Haque & Srivastava, 2014). This feature makes it possible for marketing teams to constantly fine-tune the advertisement, content, and other information delivery and thereby heighten responsiveness and relevance (Haibin et al., 2022). In addition to these, the Decision support systems also became one of the key MIS features globally affecting the marketing results. They use large data and make recommendations in the form of graphical interfaces and models that allow for simulation (Almuhatresh et al., 2022). Marketers can apply DSS in developing trends that predict consumption patterns and also for analyzing several potential strategies and effects of each on sale campaigns (Wangyanwen et al., 2023). The ability to design scenarios of potential realities and select the best of those in advance strongly enhances marketing planning and action.

The findings of this study point towards the fact that it is not just beneficial for marketing functions to operationalize MIS tools; the tools in fact signify strategic catalysts. Proper implementation of MIS technologies leads to adjustments in the function of the marketing departments from being tactical and campaign focused to being strategic, analytical, and consumer focused. It was not very long ago that businesses relied on intuition to determine the right time to reach out to customers, right type of message to convey, and the right channel to use to communicate to the customers.

Consequently, the findings of this study support the hypothesis that enhancement of MIS capabilities enables organizations to enhance customer loyalty, satisfaction and interactivity. Modern consumers increasingly expect seamless digital experiences, personalized offerings, and rapid responses to inquiries. MIS platforms are anticipated to play a pivotal role in enabling brands to meet these evolving expectations in real time. For instance, by leveraging MIS-driven customer service data, interactive chatbots can develop a comprehensive understanding of individual consumer profiles, allowing for more precise and contextually relevant interactions. Similarly, real-time recommendation tools analyze customer activity to generate tailored product suggestions, enhancing engagement and conversion rates. These advancements underscore the strategic significance of MIS in optimizing marketing operations and fostering consumer satisfaction.

For any strategic business leader or a marketing manager, this study reaffirms the need to consider MIS not as a tool but as a brand enabler. From the brand-consumer relationships' perspective, MIS helps to foster trust, relevance, and emotional appeal, which would appear to be pivotal for developing long-term relationships with the customers and, as a result, gaining brand equity. Implementing MIS systems with features such as artificial intelligence, machine learning, and big data analysis will enable organizations to gain more insights about the customers regarding prism attributes and their stages in the customer cycle. However, based on the findings of this research, marketing education and training programs must include MIS

competencies. Due to the market discipline growing to become a combination of many specialties, marketing professionals should possess not only the skills of presenting their message but also interpretational skills, technical skills and system thinking skills as well. It is therefore becoming increasingly imperative to understand that MIS literacy cannot be kept exclusive to the IT departments but must be embraced by the marketing practitioners regardless of the industry.

Implication of the Study

The findings of this study offer substantial theoretical and practical contributions to the fields of marketing, management information systems (MIS), and business strategy. In the current environment where consumers are considered another important source of competitive advantage customer-oriented paradigms are integrated with MIS system into the contemporary mandate. Not only does this research attempt to redefine MIS in the contemporary organizations but also offers practical insights that may benefit the marketing professionals, the designers of the MIS systems and decision makers at strategic levels.

The current study seeks to contribute to the changing of the MIS functionalities such as real-time analytics, automated reporting, decision support systems (DSS) and centralized data in consumer engagement by providing empirical evidence, which connects the existing gap between the extent literature on technology adoption and the behavior of consumers. Previous research has tackled the MIS subject from an economic perspective, advocating for improved cost-efficiency and enhanced process optimization, or in connection with enterprise resource planning (ERP); this work does not follow this paradigm, as, instead of focusing on the benefits attributable to MIS technicalities, it will investigate how MIS facilitates customer-oriented outcomes as instrumental to marketers (Haibao, W., & Haque, R. (2023).

From a practical standpoint, this study offers measurable and timely recommendations for marketing managers, IT professionals, system designers, and business strategists seeking to enhance the consumer experience through technology-driven solutions. A critical insight for practitioners is the recognition that not all MIS functionalities exert a significant influence on marketing outcomes. However, real-time analytics and automated reporting have been identified as particularly influential in customer engagement, enabling marketing departments to prioritize high-value MIS components that directly impact consumer activity, satisfaction, and loyalty.

For marketing managers, there are several implications or a strategy map for the integration of MIS. It means that organizations must learn to invest in Dashboard based reporting tools, Consumer's Journey mapping tools, and Predictive Analytics tools that would enable real time campaign optimizations and consumer segmentation. These tools do not only improve the operations efficiency but also make a consumer interaction relevant, timely, and contextual. For example, a business employing digital advertising will utilize MIS for analyzing the click-through rates and traffic for a specific ad campaign and make immediate alteration of its position or content.

Further, the research stresses the significance of more formal training programs aimed at cementing key technical competence among the marketing teams that deal with MIS, in order to effectively interpret and act on the insights provided to them. As is often the case, MIS platforms in many organizations are underutilized since the end-users do not have sufficient training needed to fully exploit the potential of the tools employed. Hence, training programs that address data interpretations, automations, as well as consumer behaviors have the potential to improve

the applicability of MIS in marketing environments (Liaw et al., 2024). Firms can also put in place constant training mechanisms or work with the MIS vendors to train employees to use the systems as per their line of duty.

Another implication that can be seen at the practical level is that there is a need for the integration between the marketing and IT department (Tripathi et al., 2024). Communication barriers that have existed between these two functions make objectives set to be out of sync with one another, technologies implemented to go to waste, and work processes to be slow. This study further emphasizes on creating the collaborative structure in which IT personnel comprehend the marketing goals and strategies while the marketing personnel grasp the technical aspects of the MIS systems (Wickneswary et al., 2024). This ensures that the developed system are not only functionally robust but also optimized for user experience and strategic marketing effectiveness.

For MIS vendors and software developers, there are the following clear design imperatives suggested by the study. Thus, the opportunities to make MIS tools act in the consumers' best interest should be revisited within the existing vendor landscape. Application of new incident handling and management concepts such as user-friendly dashboards, drag and drop analytics tools, reporting templates and self-learning recommendation systems have become basic requirement for any organization to compete in the market. It is also important to ensure that these systems are capable of working with other digital tools including the Customer Relationship Management system (CRM), social media management systems, and e-commerce engines. The findings from the study can thus be useful in guiding the product innovation plans of IT firms that seek to serve marketing organizations (Ying et al., 2023).

Moreover, at the strategic level, the study provides a guideline to differentiate the company through technology innovation. In such circumstances where firms offer similar goods and services, consumer engagement marks the thin line between the success or failure of a firm (Haque et al., 2024). Policy frameworks governing digital transformation necessitate the inclusion of MIS within marketing and customer service operations to enhance efficiency and strategic decision-making. Similarly, academic curricula should be updated to integrate MIS and marketing education, ensuring that the future workforce is equipped with the interdisciplinary knowledge required to navigate the evolving digital landscape.

Limitations of the Study

Despite the solid and rigorous methodology used in this study, there are some assumptions that existed like the data gathered were based on respondents' self-reports from marketing personnel, which may result from self-report bias and demand effects. Although the study has found correlations between the MIS components and engagement with statistical significance, it cannot conclude that the use of the mentioned MIS tools leads to increased levels of engagement in the future.

Future Recommendation

Based on the findings of the current study, the following suggestions for the future research are proposed. Firstly, there should be increase adoption of longitudinal research designs to investigate the long-term effects of MIS integration on consumer engagement. As for recommendations for further research, it would be significant to continue the analysis of other technological constructs beyond MIS that might enrich or obscure marketing strategies, including AI, ML, Predictive Analytics, and Blockchain. Such technologies not only enhance the participation level but also potentially enhance the level of trust, individualization, and

customers' personal information protection. Thirdly, the understanding would be enhanced by cross and multinational comparative research because it would demonstrate how the integration of MIS differs according to country, and the regulatory and consumer behavior environment.

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