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Article

Digital marketing integration and educational product innovation: the mediating effect of organizational innovation climate

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ABSTRACT

This study investigates the relationships between digital marketing strategies (social media marketing, video marketing, and artificial intelligence marketing), organizational innovation climate, and product innovation performance in Malaysian educational institutions, focusing on the mediating effect of organizational innovation climate. A quantitative cross-sectional survey design is employed, collecting data from 169 employees working in Malaysian educational institutions, including administrative staff, marketing personnel, academic leaders, and innovation team members from both public and private institutions. The research model is tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that all three dimensions of digital marketing positively impact organizational innovation climate, with artificial intelligence marketing demonstrating the strongest effect (β = 0.323), followed by video marketing (β = 0.289) and social media marketing (β = 0.247). Organizational innovation climate significantly influences product innovation performance (β = 0.683). While social media marketing and video marketing exhibit both direct and indirect effects on innovation performance, artificial intelligence marketing operates entirely through organizational innovation climate, indicating full mediation. The results suggest that educational institutions should implement advanced digital marketing tools alongside nurturing organizational structures that support innovation, with artificial intelligence marketing investments requiring simultaneous development of innovation-friendly climates. Strategic digital marketing significantly impacts educational product innovation through organizational innovation climate, enabling institutions to adapt to emerging insights and design innovative educational products tailored to student demands.

1. Introduction

As an outcome of the ongoing changes in the spheres of innovation and technology, the application of marketing tools and concepts in educational institutions has gained significance in enhancing competitiveness and innovation. The problem of the organizational innovation model and the concepts and techniques of digital marketing intersection is very important but still remains insufficiently researched, particularly in regard to educational innovation [1, 2]. As educational institutions strive to enhance their competitiveness and foster innovation capabilities, there is an urgent need to understand how digital marketing tools and organizational factors interact to drive educational product innovation. Malaysian educational institutions face significant challenges in their pursuit of becoming regional hubs for international education. Despite substantial investments in digital technologies and marketing initiatives, many institutions struggle to effectively translate these investments into tangible innovation outcomes. The primary challenge lies in understanding how different dimensions of digital marketing–specifically social media marketing, video marketing, and artificial intelligence (AI) marketing–contribute to educational product innovation. Furthermore, the role of organizational innovation climate as a potential mediating mechanism between digital marketing strategies and innovation performance remains unclear. This knowledge gap is particularly problematic for Malaysian educational institutions, which must navigate the complex dynamics of digital transformation while maintaining their competitive positioning in an increasingly saturated market.

The implementation of marketing technologies such as social media, video advertisements, and AI tools enables educational institutions to effectively engage with prospective students, gather data, and market differentiate their offerings [3]. These strategies go beyond promotion and serve to fully understand students, engage with them in co-creating their educational paths, and develop responsive solutions that address market needs. As pointed out by Paños-Castro et al. [4], the consequences of digital transformation on an institution go beyond technological integration, including substantially more profound alterations to the organizational culture and innovation ecosystems. This change is crucial for Malaysia's education industry as institutions are trying to brand themselves as regional hubs for international education.

The impact of digital marketing on organizational processes becomes evident through its influence on structural and cultural components. Organizational innovation climate, defined as the shared perceptions within an organization regarding policies, behaviors, and actions that support and encourage innovation, emerges as a crucial mediating variable in this relationship [5]. Such a climate enables organizations to effectively capitalize on market knowledge acquired through digital marketing channels by transforming it into concrete product innovations. As noted by Kim et al. [6], a stronger organizational innovation climate tends to amplify the influence of external inputs, including market feedback captured through digital means, on innovation outcomes. The investigation of how organizational structural components relate to digital marketing adoption as institutional policy presents a compelling perspective for examining how innovation outcomes can be enhanced in higher education institutions.

Despite the growing importance of digital marketing in educational contexts, the relationship between digital marketing strategies, organizational innovation climate, and educational product innovation performance has not been comprehensively investigated, particularly within the Malaysian educational marketplace. This research is aimed at examining the impact of digital marketing elements−namely, social media marketing, video marketing, and AI-driven marketing−on educational product innovation through the mediating role of organizational innovation climate. Specifically, this study seeks to examine the direct impact of these digital marketing strategies on educational product innovation performance, investigate their influence on organizational innovation climate, analyze the mediating role of organizational innovation climate in these relationships, and identify the differential effects of various digital marketing dimensions on innovation outcomes.

The scope of this research is focused on Malaysian educational institutions with the hope of enhancing both the conceptual framework and actionable recommendations towards the application of digital marketing to foster innovation in the education sector. The findings would be of great importance to educational institutions struggling to undergo a digital transformation while maintaining a strategic position characterized by continuous innovation. By elucidating the complex relationships between digital marketing strategies, organizational factors, and innovation outcomes, this research contributes to the broader discourse on educational innovation and digital transformation in emerging market contexts.

2. Literature review

2.1 Digital marketing strategies in educational institutions

The shift in technology and the perception of students has greatly changed the marketing landscape of educational institutions. The term digital marketing strategies encompasses a wide variety of methods used to connect with target audiences and improve an organization's productivity using online tools. In education, these strategies have become more sophisticated, involving extensive promotional engagements and stakeholder activities [5]. As a result, social media has become one of the leading marketing channels for educational institutions to build their presence and interact with prospective students. Effectively overcoming social media marketing challenges enables educational institutions to tailor their engagement with specific segments of their audience, particularly international students seeking courses [6]. Video marketing serves as an additional important aspect of digital marketing within an educational framework. Storytelling visually not only allows institutions to highlight their facilities and programmes but also enables them to showcase student activities in a more engaging way. Bustard et al. [7] emphasize that the application of design thinking with digital videos enables the creation of captivating experiences, which significantly impact student engagement and enrollment. The use of Artificial Intelligence (AI) has also transformed the approach to marketing within the educational field by providing targeted analytics, data-driven personalization, and forecasting. As demonstrated by Xiong et al. [8], the capabilities of digital integration, particularly those of AI, strengthen relationships between buyers and suppliers while facilitating product development through enhanced systems of information processing and decision-making.

2.2 Organizational innovation climate and its role in education

Organizational innovation climate represents the shared perceptions within an organization regarding policies, practices, and procedures that support and encourage innovative initiatives. In educational organizations, this climate has pronounced ramifications for how well organizations engage the market and technological innovation. Fischer & Riedl [9] study the strain potential of organizational innovation climate and attend to the intricate interrelations between the pressure for innovation and organizational productivity. Innovation climates tend to enhance creativity, but the findings indicate that they need to be managed to avoid stress that is counterproductive among faculty and staff. Newman et al. [10] further explain the organizational innovation climate by focusing on strategically important elements, such as faculty and leadership resource support, innovative team units, and inter-organizational collaboration, which influence innovation in an educational setting. Likewise, in their research, Li et al. [11] demonstrate that the learning climate of a team affects its innovation performance through the organization's capabilities for knowledge integration, thereby showing that educational institutions should foster systems that enable knowledge and learning to circulate continuously in order to enhance their innovative potential.

2.3 Educational product innovation performance

The effectiveness and efficiency with which an institution designs and executes new or upgraded educational offerings revolve around its educational product innovation

performance. For instance, Varadarajan et al. [12] focus on societal benefit-oriented digital product innovations. These innovations, as well as digital marketing innovations, are interdependent, especially within an educational framework. Successful educational product innovations tend to intertwine technological and marketing elements to fulfill shifting educational demands, as outlined by the authors.

Within the scope of educational organizations, the criteria for measuring product innovation performance have expanded to include market engagement, student satisfaction, and operational efficiency. Shi et al. [13] discuss the interrelatedness of digital marketing and corporate innovation strategy, clarifying that innovation management plays a key role in strategic mediation. Their study illustrates that digital marketing combined with innovation management is far more effective than when both are treated independently.

2.4 Theoretical framework and hypotheses development

The theoretical foundation of this study integrates two complementary frameworks to explain the complex relationships between digital marketing strategies, organizational innovation climate, and product innovation performance. The Unified Technology Acceptance and Use Theory (UTAUT) offers insights into how marketing technologies are adopted and utilised by some educational institutions [14]. UTAUT provides valuable insights into the factors that influence the acceptance and utilization of digital marketing technologies, including performance expectancy, effort expectancy, social influence, and facilitating conditions. The organizational learning theory serves as the secondary theoretical lens, articulating how market-oriented insights obtained through digital marketing are systematically converted into innovative educational products through organizational learning processes [15]. This theory complements UTAUT by explaining the transformation mechanisms through which technological adoption translates into innovation outcomes. The integration of these theories creates a comprehensive framework where UTAUT explains the adoption and acceptance of digital marketing technologies, while organizational learning theory elucidates how organizations convert the insights gained from these technologies into concrete innovation outcomes through enhanced organizational innovation climate.

Based on the literature review, the following hypotheses are formulated.

H1: In educational institutions, digital marketing strategies impact product innovation performance positively.

H2: Organizational innovation climate acts as a mediator in the relationship between digital marketing strategies and product innovation performance.

H2a: Digital marketing strategies have a positive impact on organizational innovation climate.

H2b: Organizational innovation climate has a positive impact on product innovation performance.

H3: Of the three dimensions of digital marketing (social media marketing, video marketing, and AI marketing), each has a differential impact on the level of product innovation performance through organizational innovation climate.

All these hypotheses form part of a single cohesive conceptual model. As demonstrated in Figure 1, the model depicts the proposed impact of digital marketing strategies, organizational innovation climate, and product innovation performance. It illustrates that the impact of digital marketing strategies extends to influencing product innovation performance both directly and indirectly through organizational innovation climate.

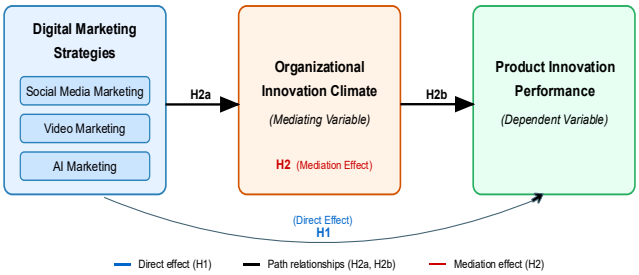

Figure 1. Research hypotheses framework

Figure 1 illustrates how the three facets of digital marketing, namely social media marketing, video marketing, and AI marketing, are predicted to shape innovation climate at the organizational level, which subsequently drives product innovation performance. This framework provides a coherent perspective for analyzing the intricate interplay among these constructs within Malaysian higher education institutions.

3. Research methodology

3.1 Research design and sample

This study used a quantitative research approach with a cross-sectional survey design to investigate the associations among digital marketing, organizational innovation climate, and product innovation performance. This approach is consistent with the positivist epistemology approach, which focuses on the measurement of social phenomena and hypothesis testing. This research received ethical approval from the institutional review board to ensure compliance with ethical standards for human subjects research. The target population comprises employees in Malaysia's educational institutions that are involved in digital marketing and product innovation. The study's sampling frame encompassed the administrative and marketing staff, academic leaders, and innovation teams from both public and private educational institutions.

The inclusion of diverse professional roles (administrative staff, marketing personnel, academic leaders, and innovation team members) as a unified sample is justified by their shared involvement in institutional digital marketing and innovation activities. While these groups may have different functional perspectives, they collectively contribute to the digital marketing ecosystem and innovation processes within educational institutions. Administrative staff provide insights into institutional policies and resource allocation, marketing personnel offer expertise in digital strategy implementation, academic leaders contribute perspectives on educational innovation needs, and innovation team members provide technical and creative insights. This multi-stakeholder approach ensures comprehensive coverage of the digital marketing-innovation interface within educational institutions.

To ensure respondents possessed relevant knowledge about their institutions' digital marketing and innovation activities, a purposive sampling method was applied. The minimum sample size was determined using G*Power analysis with parameters set at medium effect size ($f^2 = 0.15$), statistical power of 0.80, and significance level of 0.05, resulting in a minimum requirement of 127 respondents [16]. To account for potential non-response and incomplete

responses, 210 questionnaires were distributed electronically using an online survey platform. After removing incomplete responses and outliers, 169 valid responses were retained for analysis, representing a response rate of 80.5%.

3.2 Measurement instruments

The survey instrument was developed based on established scales from previous studies, with necessary adaptations to fit the educational context. For the organizational innovation climate construct, measurement items were specifically adapted for the educational context through a systematic process involving literature review of education-specific innovation studies, consultation with education sector experts, and pilot testing with educational professionals. The adaptation process ensured that items captured the unique characteristics of innovation climate in educational settings, including academic freedom, collaborative research culture, and institutional support for pedagogical innovation. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Content validation for the educational context adaptations was conducted with a panel of eight experts comprising three academics specializing in educational innovation and five practitioners with extensive experience in educational institution management and digital marketing. The expert panel evaluated each measurement item for relevance, clarity, and appropriateness within the Malaysian educational context. The measurement of digital marketing strategies incorporated three dimensions based on the conceptual framework. The AI marketing construct was specifically developed for the educational context, incorporating items that reflect AI applications commonly used in educational institutions, such as chatbots for student inquiries, predictive analytics for enrollment management, personalized learning recommendations, and automated content curation for educational programs. For organizational innovation climate, the study adapted measurement items that capture organizational practices and procedures supporting innovation within educational institutions. Product innovation performance measurement focused on both the effectiveness and efficiency of innovation outcomes in the educational context. Table 1 presents the operational definitions and sample measurement items for each construct.

3.3 Data collection procedure

Data collection was conducted between January and March 2025 using a standardized online survey platform. Before distribution, the questionnaire was pre-tested with eight experts (three academics and five practitioners) to assess content validity, clarity, and comprehensiveness. Their feedback led to minor modifications in the wording of several items to enhance clarity. The revised questionnaire was then pilot-tested with a sample of 25 respondents to evaluate reliability. Cronbach's alpha values for all constructs exceeded the 0.70 threshold, indicating satisfactory internal consistency.

To mitigate potential common method bias, several procedural and statistical remedies were implemented. Procedurally, the survey design included reverse-coded items, varied response formats where appropriate, and assured respondent anonymity to reduce social desirability bias. The questionnaire was structured to separate predictor and criterion variables temporally within the survey to minimize common method variance.

Table 1. Constructs, measurement, and operational definitions

Construct	Operational Definition	Sample Items
Social Media Marketing (SMM)	The strategic use of social media platforms to engage with stakeholders, build brand awareness, and promote educational services	"Our institution regularly updates content on social media platforms". "We actively engage with user comments on our social media channels".
Video Marketing (VM)	The creation and distribution of video content to promote educational products and services	"We create instructional videos to showcase our educational programs". "Our video content effectively communicates our institution's unique value proposition".
AI Marketing (AIM)	The application of artificial intelligence technologies to enhance marketing activities and personalize customer experiences	"We use AI to analyze student data and personalize marketing messages". "Our institution employs chatbots to provide immediate responses to inquiries".
Organizational Innovation Climate (OIC)	The shared perceptions of organizational practices, procedures, and behaviors that support innovation	"Leadership actively encourages new ideas and approaches". "Resources are readily available for implementing innovative projects".
Product Innovation Performance (PIP)	The effectiveness and efficiency with which an organization develops and implements new or improved educational products	"Our new educational products/services have been well received by the market". "The innovation process in our institution is efficient in terms of time and resources".

Additionally, Harman's single-factor test was conducted to assess the presence of common method bias, where all measurement items were loaded into an exploratory factor analysis to determine if a single factor accounts for the majority of variance. The survey was distributed to potential respondents via institutional email channels, with an introductory message explaining the research purpose, confidentiality assurances, and voluntary participation. To increase response rates, follow-up reminders were sent at two-week intervals. The survey included screening questions to ensure respondents had knowledge of their institutions' digital marketing strategies and innovation activities. Demographic information such as gender, age, job position, years of experience, and institutional type was also collected to enable sample characterization and potential control variable analysis.

3.4 Data analysis techniques

The collected data were analyzed using a two-step approach as suggested in methodological literature. First, the measurement model was assessed for reliability, convergent

validity, and discriminant validity using SmartPLS 3.0 software. Second, the structural model was evaluated to test the hypothesized relationships. Partial Least Squares Structural Equation Modeling (PLS-SEM) was chosen as the analytical technique due to its suitability for complex models with multiple constructs and its robustness against non-normality.

For the measurement model, reliability was assessed using Cronbach's alpha, composite reliability (CR), and rho_A, with values above 0.70 considered acceptable. Convergent validity was evaluated using average variance extracted (AVE), with values exceeding 0.50 deemed satisfactory. The formula for AVE is as follows:

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n} \quad (1)$$

where λ_i represents the standardized factor loading, and n is the number of items.

Discriminant validity was examined using the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio, with HTMT values below 0.85 indicating adequate discriminant validity. For the structural model, path coefficients (β), t-values, and p-values were calculated to assess the statistical significance of the hypothesized relationships. The coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2) were examined to evaluate the model's explanatory and predictive power. The effect size was calculated using the following formula:

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}} \quad (2)$$

To test the mediating effect of organizational innovation climate, the bootstrapping procedure with 5,000 resamples was employed to estimate the significance of indirect effects. The specific indirect effect was calculated as the product of the path coefficients:

$$\beta_{indirect} = \beta_a \times \beta_b \quad (3)$$

where β_a represents the path from digital marketing strategies to organizational innovation climate, and β_b represents the path from organizational innovation climate to product innovation performance. The mediation analysis followed the approach recommended in current methodological literature, which focuses on the significance of indirect effects rather than the traditional step approach. This method provides a more robust assessment of mediation effects, particularly in complex models with multiple mediating pathways.

4. Research results

4.1 Respondent demographics

The study achieved a response rate of 80.5%, with 169 valid responses retained from the initial 210 distributed questionnaires. The demographic profile of respondents, as presented in Table 2, reveals a diverse sample representing various roles and institutions within Malaysia's educational sector. The gender distribution was relatively balanced, with 53.8% male and 46.2% female participants. The majority of respondents (42.6%) fell within the 36-45 age group, followed by the 26-35 age range (28.4%). In terms of institutional representation, private educational institutions constituted the largest segment (57.4%), with public institutions accounting for 42.6% of the sample. Regarding job positions, 35.5% of respondents held administrative roles, while 26.6% were marketing personnel, 22.5% were academic leaders, and 15.4% were innovation team members. The distribution of work experience demonstrated that 38.5% of respondents had 6-10 years of experience, 27.8% had 11-15 years, and 19.5% had more than 15 years, ensuring that the sample included professionals with substantial knowledge of institutional practices.

Table 2. Demographic profile of respondents

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	91	53.8
	Female	78	46.2
Age	18-25	15	8.9
	26-35	48	28.4
	36-45	72	42.6
	46-55	27	16.0
	Above 55	7	4.1
Type of Institution	Public Educational Institution	72	42.6
	Private Educational Institution	97	57.4
Job Position	Administrative Staff	60	35.5
	Marketing Personnel	45	26.6
	Academic Leader	38	22.5
	Innovation Team Member	26	15.4
Years of Experience in Institution	Less than 3 years	24	14.2
	3-5 years	33	19.5
	6-10 years	65	38.5
	11-15 years	47	27.8

4.2 Measurement model assessment

Prior to assessing the measurement model, common method bias was evaluated using Harman's single-factor test. The results indicated that no single factor accounted for the majority of variance (the largest factor explained 34.2% of the total variance), suggesting that common method bias was not a significant concern in this study.

The reliability and validity of the measurement model were thoroughly assessed to ensure the robustness of the research instrument. As shown in Table 3, all constructs demonstrated satisfactory reliability, with Cronbach's alpha, composite reliability (CR), and rho_A values exceeding the recommended threshold of 0.70. Social Media Marketing (SMM) exhibited the highest internal consistency (α = 0.894, CR = 0.921), while AI Marketing (AIM) showed the lowest, though still acceptable, reliability values (α = 0.783, CR = 0.851).

Table 3. Reliability and validity assessment

Construct	Number of Items	Cronbach's Alpha	rho_A	Composite Reliability	AVE
SMM	4	0.894	0.898	0.921	0.745
VM	4	0.876	0.879	0.915	0.730
AIM	5	0.783	0.792	0.851	0.587
OIC	6	0.862	0.867	0.897	0.594
PIP	5	0.854	0.859	0.896	0.634

Note: SMM = Social Media Marketing; VM = Video Marketing; AIM = AI Marketing; OIC = Organizational Innovation Climate; PIP = Product Innovation Performance; AVE = Average Variance Extracted.

Convergent validity was confirmed by examining the Average Variance Extracted (AVE) values, all of which exceeded the 0.50 threshold, indicating that more than half of the variance in each construct was explained by its indicators. The highest AVE value was observed for Social Media Marketing (0.745), suggesting strong convergent validity for this construct.

Discriminant validity was assessed using both the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. Table 4 presents the Fornell-Larcker criterion results, where the square root of AVE for each construct (shown in bold on the diagonal) exceeds its correlation with other constructs, confirming discriminant validity. Additionally, all HTMT ratios were below the conservative threshold of 0.85, further supporting the discriminant validity of the constructs (Table 5).

Table 4. Fornell-larcker criterion

Construct	AIM	OIC	PIP	SMM	VM
AIM	**0.766**				
OIC	0.586	**0.771**			
PIP	0.517	0.683	**0.796**		
SMM	0.429	0.542	0.495	**0.863**	
VM	0.468	0.578	0.538	0.617	**0.854**

Note: Bold values on the diagonal represent the square root of AVE.

Table 5. Heterotrait-monotrait (HTMT) ratio

Construct	AIM	OIC	PIP	SMM	VM
AIM	**0.766**				
OIC	0.586	**0.771**			
PIP	0.517	0.683	**0.796**		
SMM	0.429	0.542	0.495	**0.863**	
VM	0.468	0.578	0.538	0.617	**0.854**

4.3 Structural model assessment

After confirming the reliability and validity of the measurement model, the structural model was evaluated to test the hypothesized relationships. Figure 2 illustrates the path coefficients and R^2 values of the path analysis model. As shown in Figure 2, the path diagram presents the relationships between the three dimensions of digital marketing (Social Media Marketing, Video Marketing, and AI Marketing), the mediating variable (Organizational Innovation Climate), and the dependent variable (Product Innovation Performance). The model displays both direct and indirect pathways, with solid lines representing the indirect effects through the mediating variable and dashed lines indicating direct effects. Statistical significance levels are clearly marked alongside each path coefficient (β).

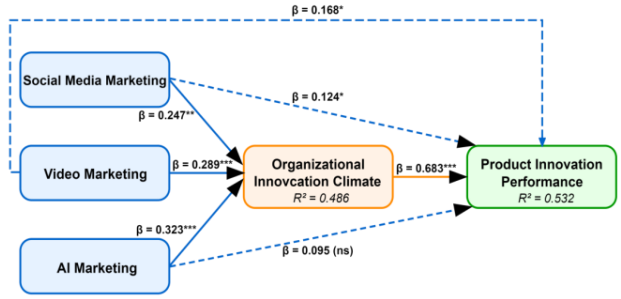

Figure 2. Path analysis of digital marketing dimensions, organizational innovation climate, and product innovation performance (Note: *p < 0.05; **p < 0.01; ***p < 0.001; ns = not significant; Solid lines represent indirect effects; dashed lines represent direct effects)

The model exhibited good explanatory power, with R^2 values of 0.486 for Organizational Innovation Climate (OIC) and 0.532 for Product Innovation Performance (PIP), indicating that 48.6% of the variance in OIC and 53.2% of the variance in PIP were explained by the model constructs. All hypothesized pathways were statistically significant except for the direct effect of AI Marketing on Product Innovation Performance.

The path coefficient analysis revealed that all three dimensions of digital marketing strategies significantly influenced organizational innovation climate, with AI Marketing showing the strongest effect (β = 0.323, p < 0.001), followed by Video Marketing (β = 0.289, p < 0.001) and Social Media Marketing (β = 0.247, p < 0.01). Organizational innovation climate, in turn, had a substantial positive effect on product innovation performance (β = 0.683, p < 0.001).

Table 6 presents the detailed results of the hypothesis testing, including direct, indirect, and total effects. The significance of these effects was determined using the bootstrapping procedure with 5,000 resamples.

The results supported Hypothesis 1, confirming that digital marketing strategies positively influence product innovation performance (β = 0.470, p < 0.001). Hypothesis 2a, which proposed that digital marketing strategies positively influence organizational innovation climate, was supported for all three dimensions: Social Media Marketing (β = 0.247, p < 0.01), Video Marketing (β = 0.289, p < 0.001), and AI Marketing (β = 0.323, p < 0.001). Hypothesis 2b, suggesting that organizational innovation climate positively influences product innovation performance, was also supported (β = 0.683, p < 0.001).

Table 6. Hypothesis testing results

Hypothesis	Path	Direct Effect	Indirect Effect	Total Effect	Result
H1	Digital Marketing → PIP	-	-	β = 0.470***	Supported
H2a	SMM → OIC	β = 0.247**	-	β = 0.247**	Supported
H2a	VM → OIC	β = 0.289***	-	β = 0.289***	Supported
H2a	AIM → OIC	β = 0.323***	-	β = 0.323***	Supported
H2b	OIC → PIP	β = 0.683***	-	β = 0.683***	Supported
H2 (SMM)	SMM → OIC → PIP	β = 0.124*	β = 0.169**	β = 0.293***	Supported
H2 (VM)	VM → OIC → PIP	β = 0.168*	β = 0.197***	β = 0.365***	Supported
H2 (AIM)	AIM → OIC → PIP	β = 0.095 (ns)	β = 0.221***	β = 0.316***	Partially Supported
H3	Differential Effects	-	-	SMM < VM < AIM	Supported

Note: SMM = Social Media Marketing; VM = Video Marketing; AIM = AI Marketing; OIC = Organizational Innovation Climate; PIP = Product Innovation Performance. *p < 0.05; **p < 0.01; ***p < 0.001; ns = not significant.

The mediation analysis provided support for Hypothesis 2, confirming that organizational innovation climate mediates the relationship between digital marketing strategies and product innovation performance. For Social Media Marketing, the indirect effect through organizational innovation climate was significant (β = 0.169, p < 0.01), and the direct effect was also significant but weaker (β = 0.124, p < 0.05), indicating partial mediation. Similarly, for Video Marketing, both the indirect effect (β = 0.197, p < 0.001) and direct effect (β = 0.168, p < 0.05) were significant, suggesting partial mediation. For AI Marketing, the indirect effect was significant (β = 0.221, p < 0.001), but the direct effect was non-significant (β = 0.095, p > 0.05), indicating full mediation. For AI Marketing, the indirect effect was significant (β = 0.221, p < 0.001), but the direct effect was non-significant (β = 0.095, p > 0.05), indicating full mediation. This finding suggests that AI marketing influences product innovation performance entirely through its impact on organizational innovation climate, highlighting the critical importance of establishing supportive organizational conditions for AI marketing initiatives to translate into innovation outcomes.

Hypothesis 3, which proposed differential effects of the three dimensions of digital marketing on product innovation performance through organizational innovation climate, was supported. AI Marketing exhibited the strongest total effect (β = 0.316), followed by Video Marketing (β = 0.365) and Social Media Marketing (β = 0.293), highlighting the varying impact of different digital marketing dimensions on innovation outcomes in educational institutions.

The model's predictive relevance was assessed using the Stone-Geisser Q^2 value obtained through the blindfolding procedure. The Q^2 values for organizational innovation climate (0.283) and product innovation performance (0.324) were both greater than zero, indicating that the model had adequate predictive relevance. Furthermore, the effect sizes (f^2) were calculated to assess the magnitude of each predictor's effect. The results showed that organizational innovation climate had a significant effect on product innovation performance (f^2 = 0.735), while the digital marketing dimensions had medium effects on organizational innovation climate, with AI Marketing showing the most significant effect (f^2 = 0.170), followed by Video Marketing (f^2 = 0.142) and Social Media Marketing (f^2 = 0.107).

5. Discussion

5.1 Theoretical implications

The results of this study make several salient contributions towards understanding the integration of marketing, innovation, and education technology in a digitally focused environment. As observed, marketing activities have both direct and indirect impacts on the innovation performance of a product through the organizational innovation climate in the context of education in Malaysia. This supports other studies, which indicate that marketing plays a role that extends beyond just advertising and provides vital intelligence needed during the innovation process and societal evaluation of product needs [8]. The pronounced mediating impact of the organizational innovation climate illustrates the pivotal role organizational elements have in transforming outside market data into innovative results.

The differences noticed in the three areas of digital marketing give further information on how different digital methods impact innovation performance. AI Marketing had the most pronounced impact of all on organizational innovation climate (β = 0.323), indicating it can considerably reshape organizational norms and encourage innovation. This corresponds with new scholarship on transformational change in organizations, which argues that the adoption of sophisticated technologies prompts paradigm shifts in core processes and competencies of the organization [17]. Institutions of higher learning that fully utilise AI marketing tools seem to be in a better position to foster an innovative climate conditions because such tools provide real-time insights and automation, which improve organizational decision-making.

Video Marketing came out as the second most significant predictor of organizational innovation climate (β = 0.289) and had a noticeable positive influence on product innovation performance (β = 0.168). This finding supports earlier work on teaching design thinking in digital marketing courses [7] by showing that educational visual narratives are also capable of strengthening institutional innovation. The significant direct effect suggests that video content may directly shape product innovation by providing vivid demonstrations of educational delivery models that inspire new approaches to educational product development.

The full mediation observed in the relationship between AI Marketing and product innovation performance offers particularly valuable theoretical insights that extend our understanding of technology-organization interactions in educational contexts. While AI Marketing showed the strongest effect on organizational innovation climate, its direct effect on innovation performance was non-significant, indicating that its influence operates entirely through the development of an innovative organizational environment. This finding provides compelling evidence that advanced digital technologies, particularly AI-driven marketing tools, require supportive organizational contexts to effectively translate into innovation outcomes, reinforcing the socio-technical perspective in innovation research.

From a theoretical standpoint, this full mediation effect suggests that AI marketing technologies function as organizational capability builders rather than direct innovation drivers. Unlike traditional marketing approaches that may have more immediate and direct impacts on product outcomes, AI marketing appears to work through a more complex pathway that involves reshaping organizational norms, processes, and innovation-supportive behaviors. This aligns with organizational learning theory, which posits that technological inputs must be absorbed and integrated into organizational routines before they can generate innovation outcomes. The finding indicates that educational institutions cannot simply implement AI marketing tools and expect immediate innovation returns; instead, they must simultaneously cultivate organizational climates that can effectively leverage these technological capabilities.

The context-dependent nature of technology effects aligns with research on manufacturing companies' adaptive marketing capabilities [18], where organizational factors mediate the impacts of technology on performance outcomes. This theoretical insight has important implications for understanding digital transformation in educational contexts, suggesting that successful AI implementation requires a holistic approach that addresses both technological and organizational dimensions.

5.2 Practical implications

The findings yield substantial practical implications for educational institutions seeking to enhance their innovation performance. The confirmed positive influence of digital marketing on innovation outcomes, both directly and through organizational climate, highlights the strategic importance of digital marketing integration beyond traditional promotional objectives. Educational institutions should view digital marketing as a strategic capability that not only enhances market visibility but also generates valuable insights for product innovation.

The profound impact of organizational innovation climate on product innovation performance (β = 0.683) indicates that higher education institutions need to foster a culture of experimentation, knowledge dissemination, and collaborative troubleshooting. Innovation climate is primarily shaped by the organization's leadership's willingness to promote risk-taking, make adequate resources available for innovation projects, and positively acknowledge inventive efforts. This aligns with the findings of Tataryntseva and Kryvobok [6], who tracked some trends of digital marketing usage that enhance financial performance via the improvement of innovation performance.

The varying impacts of the dimensions of digital marketing have critical implications for guiding resource allocation strategies, particularly regarding AI marketing investments. Given the pronounced impact of AI Marketing on organizational innovation climate and its full mediation effect, educational institutions should adopt a dual-pronged approach when implementing AI marketing initiatives. First, institutions should focus on building technical capabilities in data analysis, interface customization, and automated engagement systems. Second, and equally important, they must simultaneously invest in creating accommodating organizational climates that support the transformation of AI insights into educational product innovations.

This finding has particularly important implications for AI marketing implementation strategies. Educational institutions should not expect immediate innovation returns from AI marketing investments alone. Instead, they should plan for a more comprehensive transformation that includes leadership development programs to support innovation, cross-functional collaboration initiatives, resource allocation for experimental projects, and reward systems that encourage creative risk-taking. This balanced investment in technological and organizational change demonstrates the socio-technical approach essential for successful digital transformation initiatives.

The direct and indirect effects of Video Marketing demonstrate its dual functionality as a strategic communication tool and a catalyst for innovation. Educational institutions can use videos to promote their existing offerings and, at the same time, consider how visual narratives can revolutionise the development of new educational products. This dual function explains why video marketing is particularly advantageous for resource-constrained institutions trying to maximise return on investment from digital marketing strategies.

The less pronounced impact of Social Media Marketing implies it might act as a foundational digital marketing capability that scaffolds critical connectivity to a market, yet offers less distinctive innovation value when compared to more sophisticated alternatives. In any case, the substantial mark it leaves on both the organizational climate for innovation and the overall innovation performance of educational products attests to its significant role as a marketing toolkit staple for educational institutions.

5.3 Limitations and future research directions

This study presents several vital contributions alongside inherent limitations that open avenues for future research. The cross-sectional design limits causal inferences, as it does not allow for a definitive explanation of causation. With regard to the marketing strategies, organizational innovation climate, and product innovation performance, longitudinal studies would be able to account for temporal dynamics to a greater extent. Furthermore, the Malaysian context is helpful for understanding emerging market dynamics, but also serves to limit the scope with regard to generalisability to other national educational systems with different technological frameworks and cultural approaches towards innovation.

Future research could explore the temporal dimensions of AI marketing implementation and its evolving impact on organizational innovation climate over time. Longitudinal studies would be particularly valuable in understanding how the full mediation effect of AI marketing develops and whether direct effects emerge as organizations mature in their AI capabilities. This study's findings, combined with Li et al. [19] research regarding consumer behaviour surrounding the purchase of innovative products, suggest that additional research could be conducted to examine how these components act as moderators in the relationship between digital marketing strategies and innovation in educational products. Kauffeld et al. [20] used multidimensional frameworks to examine the dimensions of digital marketing within educational contexts, providing opportunities for further examination of newly emerging innovative approaches.

The use of self-reported measures is another limitation because different respondents might have different interpretations of innovation performance. Objective measures of innovation outcomes, for example, the success rate of new programmes launched or their adoption rates, could be more reliable. This study concentrated primarily on internal organizational factors, with limited attention to the external environment. Future research could analyse the

impact of competitive intensity, regulatory environment, or technological turbulence as moderators of the relationships examined in this study.

Research might also focus on the microfoundations of innovation climate in educational institutions, examining how organizational leadership styles, structural configurations, and human resource policies shape supportive environments for innovation. Furthermore, comparative studies across different types of educational institutions, such as public versus private or traditional versus online institutions, could reveal context-specific patterns regarding the effectiveness of digital marketing strategies for innovation outcomes.

6. Conclusion

This research examined the interactions between digital marketing, organizational innovation climate, and product innovation performance in educational institutions in Malaysia. The results indicated that the constituent elements of digital marketing, namely, social media marketing, video marketing, and AI marketing, impact product innovation performance both directly and indirectly through organizational innovation climate. AI marketing was the most dominant factor impacting organizational innovation climate, with video marketing and social media marketing following sequentially. These findings illustrate that not all dimensions of digital marketing have the same influence. A considerable portion of the impact of organizational innovation climate on productivity underscores the need to foster an environment that encourages innovation in order to fully leverage investments in marketing technologies. Educational institutions that want to strengthen their innovative capabilities should adopt sophisticated digital marketing models while simultaneously fostering climates that support organizational innovation to promote versatility in innovation tools and techniques at their disposal. Such an approach allows educational institutions to better utilise the insights garnered through digital marketing to develop innovative educational products that respond to the changing needs of the students and the marketplace. With ongoing developments in technology and shifting student expectations, embedding digital marketing within innovation processes represents one of the most strategic pathways for educational institutions to preserve their competitive edge and stay relevant. The results of this research add to the knowledge base of theory and provide actionable insight on how digital marketing can augment innovation performance in education, especially in newer educational markets dealing with the challenges of digital transformation.

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Ethical issue
This research received institutional review board approval, and all participants provided informed consent prior to data collection. The authors are aware of and comply with best practices in publication ethics, specifically with regard to authorship (avoidance of guest authorship), dual submission, manipulation of figures, competing interests, and compliance with policies on research ethics. The author adheres to publication requirements that the submitted work is original and has not been published elsewhere.

Data availability statement
The survey data supporting the conclusions of this article are available from the corresponding author upon reasonable request while maintaining participant confidentiality.

Conflict of interest
The authors declare no potential conflict of interest.

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