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Review Article

The Role of AI Literacy and Educational Attainment in Digital Consumer Engagement: Evidence from Cross-Border E-Commerce

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Abstract

Introduction: Literary translation differs from informational translation because literary works communicate through meaning, voice, rhythm, imagery, symbolism, cultural identity, characterization, and aesthetic effect. Novels, poetry, and short stories therefore require translators to balance semantic fidelity with the recreation of literary experience.

Objective: This paper examines the principal challenges of literary translation, focusing on novels, poetry, short stories, metaphors, cultural references, and idioms. It also evaluates the emerging role of artificial intelligence and proposes a genre-sensitive framework for literary translation and quality assessment.

Method: An integrative literature review was conducted using foundational theories of translation, cultural transfer, equivalence, translator visibility, rewriting, and descriptive translation studies, together with recent empirical research on literary machine translation, poetry translation, metaphor translation, lexical diversity, creativity, and literary evaluation.

Results: The synthesis shows that literary translation cannot be reduced to word-for-word correspondence. Novels require sustained attention to narrative voice and consistency; short stories require economy, pacing, and control of the ending; poetry requires negotiation among meaning, sound, rhythm, imagery, and ambiguity. Metaphors, idioms, and cultural references frequently require functional adaptation rather than literal substitution.

Conclusion: Literary translation is an interpretive and creative act in which the translator reconstructs a literary work for a new linguistic and cultural audience. Artificial intelligence can support exploration and drafting, but human literary judgment remains essential for preserving voice, cultural specificity, figurative meaning, and artistic identity.

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1. Introduction

Cross-border e-commerce has expanded from a peripheral channel to a central driver of international trade, with global retail e-commerce sales projected to exceed six trillion US dollars by 2027. As brands compete across increasingly fragmented digital marketplaces, artificial intelligence has become the infrastructural layer through which personalization, recommendation, and consumer engagement are orchestrated at scale [1]. AI-powered systems determine which products appear in a consumer's feed, which messages are delivered and when, and how prices adjust in real time across national boundaries [2]. For international marketers, this technological shift promises unprecedented precision in reaching consumers who may be thousands of miles away, culturally distinct, and linguistically divergent. The broader transformation of business and marketing practice by AI has been widely documented, underscoring both its promise and its contested implications for firms and consumers [3, 4, 5].

Yet the translation of AI capability into measurable engagement outcomes is not uniform. Recent evidence suggests that consumer responses to AI-mediated persuasion depend heavily on the recipient's capacity to recognize, evaluate, and critically interpret algorithmic intent [6, 7]. This capacity, variously termed AI literacy or algorithmic awareness, does not emerge spontaneously. It is cultivated through formal education, digital-skills training, and cumulative exposure to AI-infused environments. The educational dimension of AI marketing effectiveness has received strikingly little empirical attention, despite its obvious policy relevance: if AI marketing works better on consumers who understand it, and if that understanding is unevenly distributed across populations, then AI-driven commerce risks amplifying rather than reducing global inequalities in market participation.

This study addresses that gap by positioning consumer AI literacy, measured with a self-report AI literacy scale and examined alongside educational attainment, as a moderating variable in the relationship between AI-driven marketing personalization and brand engagement. We argue that education does not merely correlate with digital access; it shapes the cognitive frameworks through which consumers interpret algorithmic persuasion, calibrate trust, and decide whether to engage with or resist AI-curated commercial content [6, 8]. In cross-border contexts, this interpretive work is compounded by cultural distance and unfamiliar market signals, making the moderating role of literacy particularly consequential.

The study makes three contributions. First, it empirically tests AI literacy as a boundary condition for AI marketing effectiveness in international settings, moving beyond main-effect models that implicitly assume universal receptivity. Second, it examines brand engagement as the mediating mechanism linking personalization to cross-border purchase outcomes, integrating consumer psychology with self-reported consumer purchase outcomes. Third, by sampling across six markets with varying levels of e-commerce maturity and educational infrastructure, it enables a preliminary assessment of cross-national heterogeneity in the moderating effect.

2. Literature Review and Hypotheses

This section reviews four streams of work: AI-driven personalization in cross-border settings, brand engagement as a mediating mechanism, AI literacy and education as moderators, and cross-national variation. It then derives the study's hypotheses.

AI personalization encompasses recommendation engines, dynamically optimized content, predictive segmentation, and adaptive messaging systems that adjust commercial stimuli to individual behavioral profiles [1]. The technical foundations of such systems, including recommendation models and their application domains, have been extensively surveyed [9], and personalization has long been understood as a lever for influencing user information processing and decision outcomes [10]. In cross-border settings, these systems are further tasked with localizing content, translating linguistic nuance, and calibrating offers to currency and regulatory differences [2]. Zhang and colleagues examined multi-domain deep learning from a multi-view perspective for cross-border e-commerce search, illustrating how computational methods can support product discovery in international online marketplaces [11]. Work on one-to-one marketing

similarly emphasizes that personalization, customization, and consumer choice are intertwined [12], while marketing analytics research shows how data-rich environments enable finer-grained targeting [13]. Research on the customer journey further situates personalization within a sequence of touchpoints that shape consumer experience [14].

However, the literature has largely treated personalization effectiveness as a technological or algorithmic question, a matter of model accuracy and data quality, rather than a consumer-side capability question. This framing obscures the interpretive labor that consumers perform when encountering algorithmic recommendations, particularly in unfamiliar cross-border environments where trust must be established without the familiar cues of domestic retail.

Brand engagement captures the cognitive, emotional, and behavioral investment consumers make in a brand relationship, encompassing interactions ranging from content consumption to advocacy and co-creation [15]. Engagement is a core construct in service and marketing research, with foundational work establishing its conceptual domain and fundamental propositions [16] and subsequent work situating it within the broader customer experience [17, 18, 19]. In digital environments, engagement has become the pivotal intermediate outcome between marketing exposure and commercial conversion. AI-driven personalization is theorized to enhance engagement by increasing perceived relevance, reducing search costs, and creating a sense of being understood by the brand [7]. Research on AI in marketing describes how AI-enabled tools are changing marketing activities and consumer-facing interactions, while emphasizing the need to evaluate their effects in context [4, 5, 20].

The mediating role of engagement between personalization and performance has been implicitly assumed rather than formally tested in cross-border contexts. We propose that AI personalization affects cross-border purchase outcomes primarily through its capacity to foster engagement, because engagement signals the reduction of psychological distance that otherwise inhibits international transactions.

H1: AI-driven marketing personalization positively influences brand engagement.

H2: Brand engagement mediates the relationship between AI-driven personalization and cross-border e-commerce performance.

The construct of AI literacy has gained traction as a descriptor of consumers' ability to recognize AI-generated content, understand algorithmic mechanisms, and critically evaluate AI-mediated communications [6]. Foundational work on AI literacy competencies and design considerations has helped specify what such literacy comprises [21]. Research on online personalization shows that consumer responses depend on how information is collected and whether trust is established [7], and work on online behavioral advertising documents the privacy and persuasion dynamics that shape those responses [22]. Work on algorithm appreciation also finds that people can prefer algorithmic judgments to human judgments in some contexts [8], whereas research on algorithm aversion shows that people may avoid algorithms after observing errors [23] and that aversion is task-dependent [24]. Related work on the "word-of-machine" effect shows that AI advice is evaluated differently across utilitarian and hedonic contexts [25]. Together, these findings suggest that the effect of AI literacy may depend on the usefulness, transparency, and context of the AI application.

In educational terms, AI literacy is not distributed randomly. It correlates with formal educational attainment, access to digital-skills curricula, and immersion in information-rich environments. Consumers with higher education are more likely to have encountered critical discussions of algorithmic bias, data privacy, and persuasive design, equipping them with evaluative frameworks that lower-literacy consumers lack. This does not mean higher-education consumers are uniformly skeptical; rather, their responses to AI marketing are more differentiated, more conditional on perceived authenticity and ethical signaling.

H3: Consumer AI literacy positively moderates the effect of AI-driven personalization on brand engagement, such that the effect is stronger at higher levels of literacy.

H4: Educational attainment is positively associated with AI literacy and, through it, conditions the personalization–engagement relationship.

The effectiveness of AI marketing is unlikely to be culturally invariant. Research on AI in marketing and cross-border digital marketing suggests that the outcomes of AI-enabled marketing may depend on the application and market context [2, 5, 20]. These sources support examining cross-national variation, but they do not by themselves establish specific differences between the

Vietnamese and Australian samples in this study. Markets with more mature digital commerce infrastructures and higher average educational attainment may exhibit more pronounced literacy-moderated effects, because the variance in AI literacy within those populations is more consequential for differentiating consumer responses. Work on the future of technology and marketing reinforces the need for context-sensitive evaluation of AI-enabled marketing outcomes [26].

3. Methods

3.1 Sample and Procedure

Data were collected via an online panel administered by a commercial survey provider between September and November 2025. Quota sampling ensured approximately equal representation across six markets selected for variation in e-commerce maturity and educational infrastructure: United States (n = 142), United Kingdom (n = 139), Germany (n = 138), Australia (n = 141), Vietnam (n = 145), and China (n = 142). The final analytic sample comprised 847 respondents after removing incomplete or inattentive responses (attention check failure rate: 6.3%).

Respondents were required to have made at least one cross-border online purchase in the preceding twelve months and to be at least 18 years of age. The sample was balanced on gender (52.1% female) with a mean age of 34.7 years (SD = 11.2). Educational attainment was distributed as follows: secondary education or below (18.4%), some tertiary or vocational qualification (31.2%), bachelor's degree (34.6%), and postgraduate degree (15.8%).

The sampling strategy provides coverage across six markets, but it should be understood as quota-based online-panel sampling rather than a probability sample of each national population. The eligibility criteria ensure that respondents have recent experience with cross-border purchasing, making the survey relevant to the research question. At the same time, people who use online panels or shop internationally may differ from non-users in digital access, income, education, and technology familiarity. The findings should therefore be generalized primarily to consumers resembling the sampled respondents, not automatically to all adults in each country.

3.2 Measures

AI-Driven Marketing Personalization. A five-item scale adapted from prior work on personalized recommendation systems was used [7]. Respondents rated the extent to which they perceived cross-border shopping platforms as tailoring recommendations, promotions, and content to their preferences (e.g., "The recommendations I receive from international shopping sites feel personally relevant to me"). Cronbach's $\alpha = 0.89$.

Brand Engagement. Six items adapted from established engagement scales assessed cognitive, affective, and behavioral engagement with brands encountered on cross-border platforms [15]. Sample item: "I actively seek out content from this brand on social media." $\alpha = 0.91$.

Cross-Border E-Commerce Performance. Three items captured self-reported purchase behavior, expenditure, and repurchase intention specific to cross-border transactions (e.g., "I have increased my spending on this international platform over the past year"). $\alpha = 0.84$.

AI Literacy. A four-item scale validated in prior research measured recognition of AI-generated content, understanding of AI system operations, and ability to distinguish authentic from synthetic content [6]. $\alpha = 0.87$.

Educational Attainment. Self-reported highest level of formal education completed, coded ordinally (1 = secondary or below, 4 = postgraduate).

Controls. Age, gender, income, prior cross-border shopping experience (years), and platform familiarity were included as covariates.

3.3 Analytical Strategy

Hypotheses were tested using structural equation modeling with maximum likelihood estimation in a two-step process: first, confirmatory factor analysis established measurement model adequacy; second, the structural model estimated direct and indirect pathways. Moderation was tested using latent moderated structural equations, and conditional indirect effects were probed at low (16th percentile), medium (50th), and high (84th) levels of AI literacy. Multi-group analysis assessed cross-national variation. All analyses were conducted in Mplus 8.8.

Reporting limitations. The available manuscript does not provide the initial screening count, survey translations and consent documentation, full item wording, country-level measurement-invariance tests, or complete conditional indirect-effect estimates. These details require confirmation from

the survey records and Mplus output; no replacement values have been inferred. Figure 1 presents the conceptual research model showing the hypothesized direct, mediated, and moderated relationships.

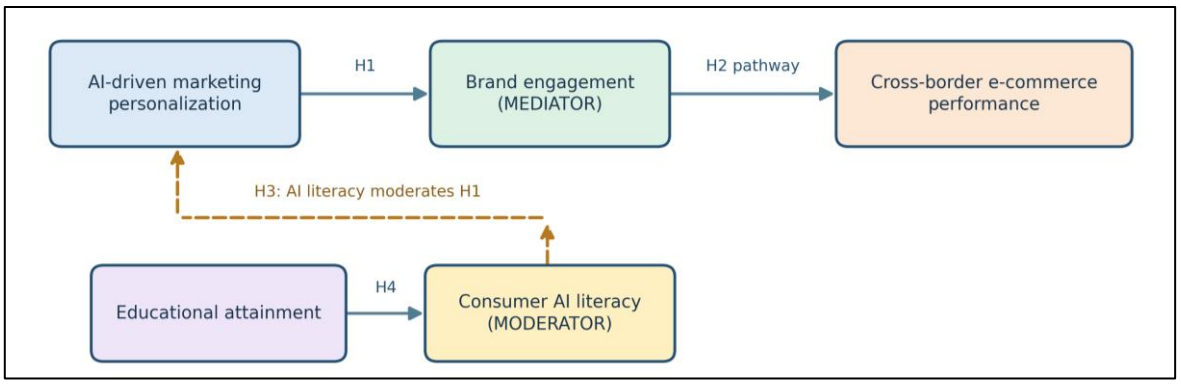


Figure 1: Analytical workflow from sample screening and measurement validation to structural modeling and three complementary analyses: mediation, moderation, and multi-group comparison.

4. Results

4.1 Measurement Model

The measurement model demonstrated adequate fit: $\chi^2(184) = 412.37$, $p < 0.001$; CFI = 0.952; TLI = 0.945; RMSEA = 0.038; SRMR = 0.041. All factor loadings exceeded 0.70, and average variance extracted values ranged from 0.61 to 0.74, supporting convergent validity. Heterotrait–monotrait ratios were below 0.85, indicating discriminant validity.

4.2 Structural Model and Hypothesis Tests

The structural model exhibited good fit: $\chi^2(212) = 478.92$, $p < 0.001$; CFI = 0.947; TLI = 0.938; RMSEA = 0.039; SRMR = 0.046. Table 1 presents the structural path estimates.

Table 1: Structural Path Estimates

Path	β	SE	t	p
AI Personalization → Brand Engagement	0.47	0.04	11.32	<0.001
Brand Engagement → Cross-Border Performance	0.52	0.04	13.01	<0.001
AI Personalization → Cross-Border Performance (direct)	0.11	0.05	2.18	0.029
AI Literacy → Brand Engagement	0.18	0.04	4.42	<0.001
AI Literacy × Personalization → Engagement	0.09	0.03	2.89	0.004
Education → AI Literacy	0.31	0.04	7.63	<0.001

Note: Reported coefficients, standard errors, and test statistics are retained as supplied. Small discrepancies may arise from rounding; confirm against the original Mplus output.

H1 was supported: AI personalization significantly predicted brand engagement ($\beta = 0.47$, $p < 0.001$). The direct effect of personalization on cross-border performance remained significant but modest ($\beta = 0.11$, $p = 0.029$), consistent with partial mediation through engagement.

4.3 Mediation Analysis

Bias-corrected bootstrap confidence intervals (5,000 resamples) confirmed the indirect effect of personalization on performance through engagement (indirect $\beta = 0.24$, 95% CI [0.17, 0.32]). The proportion mediated was 0.69. H2 was supported.

4.4 Moderation by AI Literacy

The interaction term for AI literacy × personalization predicting engagement was significant ($\beta = 0.09$, $\Delta R^2 = 0.03$, $p = 0.004$). Conditional effects revealed that the personalization–engagement relationship was strongest at high AI literacy ($\beta = 0.58$, $p < 0.001$), moderate at mean literacy ($\beta = 0.47$, $p < 0.001$), and weakest, though still significant, at low literacy ($\beta = 0.33$, $p < 0.001$). H3 was supported.

4.5 Cross-National Comparison

Multi-group analysis revealed significant differences in the moderation effect across markets ($\Delta\chi^2(5) = 18.42$, $p = 0.002$). The literacy × personalization interaction was strongest in the German and Australian samples ($\beta = 0.14$ and 0.12,

respectively, both $p < 0.01$) and non-significant in the Vietnamese sample ($\beta = 0.02$, $p = 0.71$). The Chinese and US samples showed intermediate effects ($\beta = 0.08$ and 0.10, respectively, both $p < 0.05$). Descriptive comparison of educational attainment distributions suggested that the Vietnamese sample had lower average formal education and lower mean AI literacy scores, potentially restricting the variance necessary to detect moderation.

5. Discussion

The findings are consistent with the proposed account of personalization as a contributor to brand engagement. The estimated coefficient for personalization and engagement is positive and statistically significant, while engagement is positively associated with cross-border performance. The remaining direct path between personalization and performance is smaller but significant, which is consistent with partial rather than complete statistical mediation. This pattern suggests that personalization may be related to performance through engagement while also retaining an association not captured by the mediator. The direct path should not be overinterpreted as a specific mechanism; it may reflect other unmeasured pathways, measurement limitations, or shared influences.

The indirect effect reported in the mediation analysis provides a more detailed view of the proposed process. The confidence interval excludes zero, supporting a non-zero indirect association under the specified model. The reported mediated proportion of 0.69 indicates that a substantial share of the estimated total association is represented by the engagement pathway in this sample. However, the proportion is not a universal constant and should not be interpreted as the percentage of sales that personalization causes. It is a model-dependent summary of cross-sectional associations, not a causal decomposition based on experimental evidence.

The moderation result is central to the educational contribution. The positive interaction indicates that the estimated personalization–engagement association becomes stronger as AI literacy increases, within the range represented by the data. This does not imply that every highly literate consumer is more engaged, nor that low-literacy consumers receive no benefit. The reported conditional effects remain positive at low, mean, and high literacy. The more precise interpretation is that literacy differentiates the strength of the association rather than determining whether personalization can work at all.

A possible explanation is that consumers with greater AI literacy may be better able to recognize the function and limitations of recommendations, evaluate relevance, and use algorithmically organized information strategically. Yet the current design does not directly test those psychological processes. It measures literacy and engagement and estimates their statistical relationship. Future studies could measure perceived transparency, privacy concern, trust calibration, perceived intrusiveness, and perceived recommendation quality to test which mechanisms explain the interaction. Experimental studies could also manipulate disclosure of AI use or provide brief literacy training before exposing participants to the same recommendation interface.

The association between educational attainment and AI literacy is consistent with the view that educational experiences can support the development of digital-evaluation skills. The indirect pathway from education through literacy to engagement further suggests that literacy may be one route through which education relates to responses to personalization. This result should not be framed as evidence that formal education alone produces AI competence. The ordinal education variable is broad, and the study does not establish whether respondents received AI-related instruction. Education may also proxy income, occupational exposure, digital access, or other unmeasured factors. The policy implication is therefore to expand accessible AI literacy opportunities, not to assume that degree attainment guarantees competence.

The cross-national results suggest heterogeneity, but country-level interpretations should remain provisional. Stronger estimated interactions in Germany and Australia and a non-significant interaction in Vietnam may reflect differences in literacy distributions, statistical power, response styles, platform experience, or other contextual factors. A significant coefficient in one country and a non-significant coefficient in another is not, by itself, proof that the coefficients differ. The reported multi-group test offers evidence of overall variation, but a complete interpretation requires measurement-invariance evidence and direct pairwise contrasts with uncertainty intervals. Explanations based on average

education or literacy should be treated as plausible interpretations unless they are directly tested in the data.

For marketing practice, the results support evaluating personalization by more than short-term clicks. Engagement, trust, perceived relevance, and consumers' understanding of why recommendations appear are also important. A strategy that maximizes immediate response while obscuring sponsorship, exploiting sensitive inferences, or making it difficult to compare alternatives may undermine long-term consumer agency. Responsible personalization should make it easy to correct preferences, access explanation and privacy controls, and see relevant alternatives. For cross-border retailers, clear delivery costs, taxes, return conditions, seller information, and localized language remain essential; AI relevance cannot compensate for an unreliable transaction experience.

The results establish a coherent chain: AI-driven personalization is associated with brand engagement, which in turn is associated with cross-border commerce performance, and this chain is strengthened among consumers with higher AI literacy and educational attainment. The moderation finding is theoretically consequential. It suggests that the effectiveness of AI marketing is not a property of the technology alone but emerges from the interaction between algorithmic sophistication and consumer competence. Consumers who understand how AI systems operate are better positioned to evaluate recommendations critically, calibrate their trust appropriately, and engage with AI-curated content in ways that yield genuine value rather than mere exposure [6, 7].

The educational pathway, education → AI literacy → strengthened personalization effects, carries a dual implication. On one hand, it suggests that investments in digital-skills education may enhance consumer welfare by enabling more discriminating engagement with AI commerce. On the other hand, it raises a distributive concern: consumers with lower educational attainment and lower AI literacy may be systematically disadvantaged in AI-mediated marketplaces, not because they are excluded from access but because the quality of their engagement is shallower and their capacity to resist manipulative personalization is weaker.

The cross-national variation complicates any universal narrative. The strong moderation effect in Germany and Australia may reflect the combination of high average literacy with significant within-country variance, allowing individual differences to matter. The non-significant effect in Vietnam, where average AI literacy was lower and variance restricted, may suggest a threshold condition: literacy moderation could become easier to detect when a sufficient proportion of consumers possess the baseline competence to differentiate AI-mediated experiences [5]. The study extends AI marketing theory in three directions. First, it moves beyond main-effect models by identifying consumer literacy as a boundary condition, answering calls for research on individual differences in AI marketing responsiveness [4, 20]. Second, it specifies engagement as the mediating mechanism, integrating consumer psychology with self-reported purchase outcomes [16, 17]. Third, it suggests that the moderating role of literacy varies across national contexts, cautioning against universal claims about AI marketing effectiveness [2, 26]. These extensions respond to broader agendas for research on AI in marketing and its societal implications [3, 5, 27, 28].

For international marketers, the findings suggest that segmenting consumers by AI literacy, not merely by demographic or behavioral variables, may improve campaign effectiveness. High-literacy consumers may respond better to transparent, value-oriented personalization that respects their autonomy, while low-literacy consumers may require more explicit guidance and trust-building signals. The educational implication is direct: as AI becomes the default interface for cross-border commerce, digital-skills curricula that include critical AI literacy may function as consumer-protection infrastructure, enabling informed participation rather than passive exposure.

Future research can strengthen the design in several ways. A longitudinal panel could measure literacy and platform perceptions at baseline, engagement at a later point, and purchase behaviour subsequently. This would improve temporal ordering, although longitudinal observation alone would not eliminate confounding. A randomized experiment could vary the degree of personalization, the transparency of AI use, or a short AI-literacy intervention and compare engagement outcomes across conditions. Combining these designs would help distinguish the effect of personalization from

the characteristics of consumers who select into using personalized platforms. A second priority is to improve measurement of AI literacy. Self-assessment is useful for capturing perceived competence, but confidence can diverge from actual knowledge. Future work should combine self-report with performance-based tasks, such as identifying AI-mediated recommendations, recognizing limits of algorithmic inference, and evaluating explanations of automated decisions. Researchers should also distinguish general AI literacy from marketing-specific literacy, data literacy, and privacy literacy. These capabilities overlap but are not identical, and each may relate differently to trust and engagement. Third, the outcome measures could be strengthened with behavioral data. With informed consent and appropriate privacy safeguards, researchers could examine product views, recommendation clicks, add-to-cart events, conversion, return rates, and repeat purchases. Behavioral records would not replace subjective measures: a click can reflect curiosity or confusion rather than meaningful engagement. Instead, behavioral and self-report measures should be analyzed together to provide a fuller account of the consumer journey. Fourth, the international comparison should include more explicit contextual measures. Rather than treating country as a proxy for culture or digital maturity, future studies could measure trust in institutions, perceived privacy protection, online-shopping experience, language proficiency, digital access, and exposure to AI-related education. Larger samples within each market would improve precision for interaction tests. Translation procedures and measurement invariance should be documented before interpreting differences across groups. Finally, future studies should examine potential nonlinear and adverse effects. Personalization may improve engagement up to a point and then produce fatigue or perceived surveillance. AI literacy may strengthen responses to transparent and useful recommendations but reduce responses to opaque or manipulative practices. Models that test these contingencies could identify when literacy supports adoption and when it supports resistance. Such a distinction is important because the goal of consumer education should be informed choice, not indiscriminate acceptance of AI-mediated marketing.

Limitations

The cross-sectional design precludes strong causal inference; longitudinal or experimental designs would strengthen the claims. Self-reported performance measures may introduce recall bias. The AI literacy scale, while validated, captures self-assessed rather than objectively tested competence. The sample, though cross-national, is drawn from panel respondents and may not represent the full spectrum of educational attainment, particularly in the Vietnamese context. Future research should incorporate behavioral platform data, experimental manipulations of AI transparency, and objective literacy assessments.

The broader contribution of this study is to connect AI marketing outcomes with consumers' capacity to interpret the systems shaping their online experiences. The reported results support an association between perceived personalization and engagement, an indirect association between personalization and cross-border performance through engagement, and a stronger personalization–engagement relationship among respondents with higher AI literacy. Educational attainment is associated with literacy, making education relevant to the discussion without reducing literacy to a degree category. The conclusions should remain proportionate to the evidence. The cross-sectional survey identifies patterns that are consistent with the proposed model, but it cannot establish causal effects or show that the same relationships will hold for every platform, product category, or population. The next stage of research should test the model longitudinally or experimentally, use objective literacy assessments and behavioral outcomes, and demonstrate measurement comparability across countries. For practice, the findings favor personalization that is relevant, transparent, and respectful of consumer autonomy, alongside accessible education that helps people make informed decisions in AI-mediated markets.

6. Conclusion

This study examined whether and for whom AI-driven marketing personalization works in cross-border commerce. The evidence indicates that personalization is associated with stronger brand engagement, that engagement statistically mediates the association with self-reported purchase outcomes, and that the personalization–engagement association is stronger at higher AI literacy; educational attainment is positively

associated with AI literacy. The educational lens is not incidental: it identifies a variable that marketers can measure, educators can cultivate, and policymakers can address. In an era when algorithmic curation governs the terms of global market access, consumer AI literacy may shape how consumers interpret and engage with AI-mediated commerce.

Declarations

Ethics Committee Approval: Ethics committee approval is not required for this study.

Author Contributions (CRediT): All authors contributed equally and approved the final manuscript.

Conflict of Interest: The authors declare no conflict of interest.

Funding: This research received no external funding.

Use of Artificial Intelligence: ChatGPT (version 4.5) was used for language editing only; it was not used to generate data, perform analyses or draw conclusions. The authors take full responsibility for the content.

Data Availability: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Peer Review: Externally peer-reviewed by independent reviewers in a double-blind process.

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