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Cite this article: Nguyen, T. T. T., Le, T. D., Tran, K. T., & Nguyen, P. V. (2025). Unveiling Student Decision-Making in Vietnam the Role of CBBE and IMC Access to Higher Education. *Educational Process: International Journal*, 16, e2025285.
<https://doi.org/10.22521/edupij.2025.16.285>

Received April 27, 2025

Accepted June 8, 2025

Published Online June 29, 2025

Keywords: Quality education, customer-based brand equity, access to higher education, educational economics, integrated marketing communication.

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Unveiling Student Decision-Making in Vietnam: The Role of CBBE and IMC Access to Higher Education

Thao T. T. Nguyen[✉], Tri D. Le[✉], Khoa T. Tran[✉], P. V. Nguyen[✉]

Abstract

Background/purpose. Vietnam's higher education (HE) market has become increasingly competitive, with institutional branding playing a crucial role in attracting prospective students. This paper examines how Customer-Based Brand Equity (CBBE) affects the choice of Higher Education Institutions (HEIs) through Integrated Marketing Communication (IMC), reversing the conventional flow from IMC to CBBE and thus offering a unique perspective so that strategies can be made practical for the recruitment of students by HEIs in the evolving educational market of Vietnam.

Materials/methods. A sample of 554 Vietnamese undergraduate students was surveyed by means of structured questionnaires. A dual-search approach was employed, first testing the hypothesized relationships using Partial Least Squares Structural Equation Modeling (PLS-SEM), then using neural network analysis to consider non-linear effects. The dimensions of CBBE (brand awareness, perceived quality, and brand loyalty) and IMC practices (digital marketing, experiential events, and personal impacts) were measured, with brand evaluation serving as a mediator.

Results. Mean scores for the CBBE constructs-brand awareness, perceived quality, and brand loyalty significantly influence the institutional preferences of students. Brand evaluation mediates the effect of CBBE on IMC channels, thereby strengthening the use of IMC channels in the decision-making process. Perceived quality significantly influences pricing, while experiential marketing and brand loyalty, through the development of emotional attachment, align with Vietnamese culture's emphasis on kinship and reputation. ANN analysis provides additional insights by exposing the non-linear effects.

Conclusion. The adoption of PLS-SEC integrated with ANN depicts synergy between CBBE and IMC in paving the way to HEI competitiveness, driven by service quality and culture-sensitive experiential marketing, followed by a unifying digital strategy toward brand equity and appeal. This study presents a novel construct on HEI branding for emerging markets, providing managers with options on how to position institutions and consequently increase enrollment in Vietnam.

1. Introduction

1.1. *Competitive Landscape of Higher Education in Vietnam and the Role of Branding*

In today's world, higher education (HE) is undergoing major global changes, with heightened competition among institutions to attract and retain students. In Vietnam, this trend has gained significant prominence due to the rapid emergence of private and public higher education institutions (HEIs) following the government's initiatives to internationalize education and increase enrollment rates (Nguyen & Tran, 2020). The proliferation of HEIs, paired with a decreasing student-age population and rising expectations of educational quality, has further sharpened the competition for willing students (Le et al., 2021). Vietnam's HE sector was propelled forward by government efforts to upgrade quality and access (Nguyen & Tran, 2020). With the immense youth population and an expanding middle class, the demand for higher education has consequently blossomed for the establishment of public and private HEIs (Le et al., 2021). The MOET reported that more than 240 universities and colleges offer programs to both domestic and international students (MOET, 2022). However, with rapid development comes an immense potential for competition, creating a situation in which branding and marketing strategies have become front-burner issues for HEIs (Pham & Do, 2022).

1.2. *Significance of Quality Higher Education and Factors Shaping Student Access*

This result has encouraged the HEIs to attempt to employ holistic branding in distinguishing themselves through a very inert atmosphere. Branding, once confined to the products, has morphed into an essential strategic instrument within the field of education for the articulation of student perceptions and lifestyle behavior toward institutional choice (Hemsley-Brown & Oplatka, 2016). The application of Customer-Based Brand Equity (CBBE) focuses on brand awareness among the target group of prospective students, establishing positive associations, perceived quality from the students' perspective, and ultimately, brand loyalty (Keller, 2001). According to Nguyen et al. (2022), institutions that harness CBBE present their unique value proposition to effectively attract students from both domestic and international markets. IMC aims to elevate the branding of HE institutions to the next level through a blend of coordinated sponsorship, social media, experiential marketing, and digital platforms, ensuring the seamless delivery of brand messages (Kliatchko, 2008). Digital transmission also enables HEIs to interact with prospective students in more personalized and immersive ways (Le & Nguyen, 2021). Promotions along social media, interactive web pages, and virtual activities are getting more relevant in the building of brand equity and the navigation of students through their decision-making (Tran et al., 2023). Branding resonates with Generation Z trends in which institutional reputation, career prospects, and personalized learning experiences weigh heavily in decision-making (Seemiller & Grace, 2016). Branding enhances institution visibility and credibility—both aspects heavily influence student decisions in Vietnam's highly contestable market (Pham & Do, 2022). In Vietnam, students tend to show a stronger preference for career-oriented, placement-friendly institutions with global connectivities, creating an additional thrust for branding in the country (Le et al., 2021). Experiential marketing strengthens emotional attachments (Pham & Do, 2022). The more the competition becomes fierce, the higher the competitive advantage is granted to HEIs building a unique and reputable identity worldwide through the CBBE and IMC application (Hemsley-Brown & Oplatka, 2016).

While previous studies have explored CBBE and IMC in the context of higher education, there remains a gap in understanding how these frameworks specifically influence Vietnamese students' choices of HEIs through a combined analytical approach using PLS-SEM and ANN techniques. Existing research has not fully investigated the mediating role of IMC practices in translating CBBE into enrollment decisions nor compared the predictive strengths of PLS-SEM and ANN in this context.

The main aim of this study is to explore how CBBE dimensions affect Vietnamese students' choice of HEIs via IMC practices, using both PLS-SEM and ANN techniques. The specific goals are threefold: (1) To assess how CBBE elements—brand awareness, brand response, perceived quality, and brand loyalty—impact IMC strategies. This goal draws from Keller's (1993) CBBE model, which argues that these equity components play a big role in making marketing communications hit home with audiences. Figuring out their influence can guide HEIs in tweaking IMC efforts to better match what students think and want (Keller, 2001). (2) To investigate whether IMC practices act as a bridge between CBBE and students' institutional picks. Here, IMC's mediating role sheds light on how brand equity turns into enrollment decisions. Duncan and Moriarty (1998) stress that a unified marketing strategy boosts brand image and sways choices. This study digs into how specific IMC tools help transform perceptions into action. (3) To weigh the predictive strengths of PLS-SEM against ANN. PLS-SEM shines in testing theories and untangling complex links (Hair et al., 2019), while ANN stands out for spotting non-linear trends in data (Kumar et al., 2020). Comparing the two aims to reveal which method best captures CBBE's effect on students' choices through IMC, offering a solid approach for analysis.

2. Literature Review

2.1. Building Brand Equity in Higher Education Through CBBE and IMC Strategies

According to Keller (1993), brand equity (CBBE model) is defined as the differential effect that brand knowledge can have on consumer response to brand marketing. The CBBE seeks to build a strong brand by creating brand knowledge and brand feelings. These include brand awareness, brand response, perceived quality, and brand loyalty; all four constitute the major dimensions for assessing brand equity in the consumer's mind (Keller, 2001). Among these, the dimensions are critical in shaping the consumer outcome in terms of perception and decision-making in selecting one institution over another (Hemsley-Brown & Oplatka, 2006) for HE. Brand awareness is the degree to which consumers remember or recognize a brand in varying conditions (Keller, 1993). Brand awareness plays an important part in HE as it increases the chances of the institution being considered during the decision-making process (Ivy, 2008). Brand responses are the constructs made by consumers bringing together the concepts of the brand, its attributes, benefits, and experiences (Keller, 2001). In HE, these associations would include perceptions of education quality, campus facilities, employability outcomes, and social environment (Pinar et al., 2014). Perceived quality means the customer's perception of the overall quality or superiority of a brand in a given category when compared with others (Aaker, 1991). For HEIs, perceived quality includes how qualified the professors are, accreditation status, relevance of curriculum, and industry linkage (Ivy, 2008). Brand loyalty can be defined as the consumer's inclination to repurchase or recommend a brand based on positive experiences and satisfaction (Keller, 2009). In HE contexts, the dimension is exhibited through the students' willingness to recommend an institution to peers and to stay connected with the institution as alumni (Hemsley-Brown & Oplatka, 2006). Brand credibility represents a characteristic related yet separate from brand loyalty; it pertains instead to the perceived trustworthiness and expertise of the brand (Erdem & Swait, 1998).

The application of IMC methods, such as digital marketing, advertising, and public engagement via social media, surely has a great impact on building the brand visibility of the institution, thus allowing prospective students to recall the institution (Bruhn & Schnebel, 2017). Brand visibility due to various digital campaigns would help build top-of-the-mind awareness by being active on social media and eventually influence students' choice (Mangold & Faulds, 2009). IMC practices such as content marketing via blogs and video testimonials provide reinforcement of those positive associations that underscore the institution's strengths and unique offerings (Holliman & Rowley, 2014). A well-integrated communication strategy would validate these associations in the same way

that a brand promise would (Kliatchko, 2008). IMC activities communicating thought leadership, faculty achievements, and industry partnerships generally increase perceived quality and attract students (Le & Nguyen, 2021). Besides, content marketing, including webinars, whitepapers, and case studies, is an effective means of communicating and establishing perceived quality (Bruhn & Schnebelen, 2017). When Vietnamese HEIs are seen to maintain a consistent IMC strategy—that is integrated marketing communications such as personalized emails, follow-up communications, and authentic student testimonials—the brands are reinforced both in credibility and loyalty. Therefore, IMC practices in Vietnamese HEIs encourage trust and engagement with their various stakeholders (Voorveld et al., 2018). Experiential marketing in the form of campus tours and open days allows potential students to directly assess the credibility of institutional claims, thus reinforcing perceptions of quality and reliability (Schmitt, 1999). These IMC strategies generally strengthen CBBE, which affects students' choice of institutions in Vietnam's competitive educational arena.

2.2. Integrated Marketing Communications Practices in Higher Education

IMC is defined as a strategic business process in planning, developing, executing, and evaluating coordinated and measurable persuasive brand communication programs over time with consumers and other audiences relevant to the purpose (Duncan & Moriarty, 1998). Core-tenets of IMC stress consistency, synergy, and consumer orientation so that all communication efforts enforce a unifying theme across multiple channels of advertisement (Schultz & Schultz, 1998). In relation to HE, IMC serves key functions to greater uplift brand equity through consistent institutional messages across many platforms that help shape the desired brand image into how it influences prospective students in their decision-making processes (Ivy, 2008). Digital marketing comprises social media marketing, search engine marketing (SEM), content marketing, and email marketing, all geared towards engaging prospective students online (Chaffey & Ellis-Chadwick, 2019). For HEIs, effective digital marketing should bring about an increased level of brand awareness, and augments interactivity and personalization to build perceived quality and credibility (Constantinides & Stagno, 2011). Potential students are properly attracted by targeted advertisements on social media platforms like Facebook, Instagram, and Youtube in conjunction with optimized websites and LMS portals (Ivy, 2008). Referrals from high school teachers, friends, and alumni usually significantly impact the choices students choose (Hemsley-Brown & Oplatka, 2006). Direct marketing tactics, personal emails, SMS campaigns, and one-to-one consultations help boost the credibility of brands by giving potential students customized information while addressing their individual concerns (Peppers & Rogers, 2004). Using CRM systems to manage and personalize communications would further enrich such relationships and be even more appealing to the institutions (Jevons, 2006).

Experiential marketing relates to prospective students being provided the opportunity to engage with the brand through memorable and interactive experiences that involve the campus tours, open days, webinars, and workshops (Schmitt, 1999). Such events enable students to build positive brand associations as they witness the atmosphere, feel the facilities, and observe the learning environment on campus (Hemsley-Brown & Oplatka, 2006). Event marketing, such as participating in education fairs and hosting webinars, also raises brand credibility by providing evident demonstrations of its strengths and expertise (Le & Nguyen, 2021). Pricing strategies, including scholarships, tuition discounts, installment payment options, and financial aid packages, serve as powerful tools for influencing students' perceptions of value (Ivy, 2008). Effective communication of these incentives vis-a-vis IMC practices may, therefore, enhance responses on the brand by diminishing anticipated monetary threats along with making an institution more attractive (Briggs & Wilson, 2007). Information transparency regarding scholarships and financial assistance seems to be effective in choosing potential students' considerations when viewed on institutional websites or through digital campaigns (Maringe, 2006).

2.3. Enhancing Access to Quality Higher Education in Vietnam: A Dual PLS-SEM and ANN Analysis

This study explores how Customer-Based Brand Equity (CBBE) and Integrated Marketing Communications (IMC) enhance access to quality higher education in Vietnam by influencing students' choices of Higher Education Institutions (HEIs). Employing a dual analytical approach, Partial Least Squares Structural Equation Modeling (PLS-SEM) tests hypothesized relationships between CBBE and IMC with 5,000 bootstrap resamples (Hair et al., 2019), while Artificial Neural Networks (ANN) capture non-linear effects using multi-layer perceptrons (Kumar et al., 2020). By integrating PLS-SEM's hypothesis-testing rigor with ANN's predictive capabilities, this research balances theoretical and practical insights into student decision-making (Leong et al., 2015; Kuo et al., 2019).

IMC practices significantly shape students' preferences for HEIs. Strategies integrating digital marketing, social media campaigns, institutional websites, and experiential marketing build brand equity through consistent, targeted messaging across multiple touchpoints (Kliatchko, 2008). Social media initiatives enhance brand awareness and shape perceptions of institutional quality and credibility (Le & Nguyen, 2021). Experiential marketing, including campus tours and virtual open days, fosters emotional connections and reinforces positive brand associations (Pham & Do, 2022). In Vietnam's competitive HE market, institutions differentiate themselves through strong career placement records and international partnerships, addressing students' growing preference for career-oriented education (Le et al., 2021). These branding efforts, rooted in CBBE and IMC, enable HEIs to build trust, command premium positioning, and gain competitive advantages (Hemsley-Brown & Oplatka, 2016).

2.4. Hypotheses Development

2.4.1. The Impact of Brand Equity (CBBE Model) on IMC Practices

The section describes how the impact of CBBE variables extends to the effectiveness of integrated marketing communication practices; in other words, the potential to make strong brand equity strengthens the effectiveness of communication strategies. Considering the effect of CBBE on IMC practices provides a reverse perspective, as most literature (Madhavaram et al., 2005; Duncan & Moriarty, 1998) discusses how IMC builds CBBE. The proposed model reverses this flow and posits that existing brand equity enhances the effectiveness of IMC strategies. In Vietnam's HE competitive scenario, an HEI often has an available brand equity area that governs how they employ IMC (reputation, awareness). Since knowledge of how the CBBE dimensions facilitate IMC would enable HEIs to customize their communication strategies based on strengths, it becomes paramount.

Keller's (1993) model of CBBE considers brand awareness as one of its many foundations, along with brand other identification and recall features by the consumer. In HE sector, institutions with high awareness leverage IMC via digital marketing in advertisements, websites, and social media. According to Aaker (1991), awareness makes all promotional efforts have a farther reach and greater effect, for a familiar brand has more participation online. In Vietnam, where digital platforms become more central to students' information-seeking (Pham & Lai, 2016), high brand awareness can help institutions efficiently implement their digital marketing campaigns in terms of awareness and interaction. Thus, brand awareness is hypothesized to positively influence digital marketing communications.

H1: Brand awareness positively influences digital marketing communications.

Perceived quality, the consumer's assessment of a brand's excellence, is a key CBBE dimension (Keller, 1993). In HE, institutions perceived as high-quality can justify premium pricing or attractive scholarships, as quality perceptions signal value (Hemsley-Brown & Oplatka, 2006). Zeithaml (1988) suggests that quality cues influence price acceptability, a critical factor in Vietnam's competitive

education market. When students perceive an institution as delivering superior education, its pricing and financial incentives gain credibility and appeal. Thus, perceived quality is hypothesized to positively influence pricing and financial incentives.

H2: Perceived quality positively influences pricing and financial incentives.

Pricing and financial incentives, such as scholarships, communicate value and affordability, which are shaped by brand response (Aaker, 1996). Positive judgments (trustworthiness) and feelings (security) toward an institution can enhance the appeal of its pricing strategies. For instance, students who view an institution as reputable may perceive its scholarships as more valuable (Chapleo, 2010). In Vietnam, where cost sensitivity is high, positive brand responses could strengthen the effectiveness of financial incentives as a differentiator (Dao & Thorpe, 2015). Therefore, brand response is posited to positively influence pricing and financial incentives.

H3a: Brand response positively influences pricing and financial incentives.

Brand response, encompassing judgments and feelings, reflects consumers' emotional and cognitive reactions to a brand (Keller, 2001). Experiential and event-based marketing, such as campus tours and open days, thrives on positive brand responses, as these activities rely on students' perceptions of institutional warmth or prestige (Lu & Xu, 2015). When students judge an institution favorably or feel positively about it, experiential marketing becomes more impactful, fostering deeper engagement. In Vietnam's community-oriented culture, positive responses may amplify event effectiveness (Nguyen et al., 2019). Hence, brand response is expected to positively influence experiential and event-based marketing.

H3b: Brand response positively influences experiential and event-based marketing.

Brand loyalty, the commitment to repurchase or repatronize a brand, is the pinnacle of CBBE (Keller, 2001). Loyal students or alumni enhance experiential marketing by acting as advocates during events, such as open days or campus activities (Nguyen & LeBlanc, 2001). Their endorsement strengthens the emotional pull of these experiences, creating a virtuous cycle of engagement. In Vietnam, where word-of-mouth and community ties are influential, loyalty could amplify event-based marketing's impact (Le et al., 2020). Hence, brand loyalty is expected to positively influence experiential and event-based marketing.

H4a: Brand loyalty positively influences experiential and event-based marketing.

Brand loyalty also extends to personal impacts (teacher recommendations) and direct marketing (emails, consultations). Loyal stakeholders, such as current students or alumni, reinforce direct marketing efforts by providing credible testimonials (Erdoğan & Çiçek, 2011). In Vietnam, high school teachers often guide student choices, and their advocacy is stronger for institutions with loyal communities (Pham & Lai, 2016). This loyalty enhances the effectiveness of personalized communication channels. Therefore, brand loyalty is hypothesized to positively influence personal impacts and direct marketing.

H4b: Brand loyalty positively influences personal impacts and direct marketing.

2.4.2. The Impacts of IMC Practices on Vietnamese Students' Choice of HEI

Integrated Marketing Communications (IMC) deliver consistent messages across channels, directly shaping consumer decisions (Duncan & Moriarty, 1998). In Vietnam's highly competitive HE sector, IMC practices—including digital marketing, pricing strategies, experiential events, and personal impacts—play a vital role in influencing students' institutional choices (Nguyen et al., 2019).

Digital marketing communications (DMC), encompassing online ads, social media, and websites, enhance visibility and engagement (Madhavaram et al., 2005). In Vietnam, where students heavily

depend on digital platforms for education research (Nguyen et al., 2019), DMC directly drives choice by increasing awareness and interest (Voorveld et al., 2018). Keller (1993) posits that a robust digital presence provides a competitive advantage by shaping early preferences. Thus, digital marketing communications are hypothesized to positively influence Vietnamese students' choice of HEI.

H5: Digital marketing communications positively influence Vietnamese students' choice of HEI.

Pricing and financial incentives (PFI), such as scholarships and affordable tuition, directly affect student choice by addressing affordability concerns (Zeithaml, 1988). In Vietnam's price-sensitive market, competitive PFI serves as a key differentiator (Dao & Thorpe, 2015). Aaker (1996) argues that financial incentives influence purchase intent by signaling value, a critical factor in HE enrollment decisions (Hemsley-Brown & Oplatka, 2006). Therefore, pricing and financial incentives are expected to positively influence Vietnamese students' choice of HEI.

H6: Pricing and financial incentives positively influence Vietnamese students' choice of HEI.

Experiential and event-based marketing (EEM), including campus tours and open days, creates emotional connections that directly influence choice (Lu & Xu, 2015). In Vietnam, where cultural events and campus experiences resonate with students (Le et al., 2020), EEM fosters engagement and preference by offering tangible experiences (Schmitt, 1999). Thus, experiential and event-based marketing is hypothesized to positively influence Vietnamese students' choice of HEI.

H7: Experiential and event-based marketing positively influences Vietnamese students' choice of HEI.

Personal impacts and direct marketing (PIDM), such as teacher recommendations and targeted emails, directly impact choice by providing credible and personalized information (Erdoğan & Çiçek, 2011). In Vietnam, where personal networks and teacher guidance are influential (Pham & Lai, 2016), PIDM builds trust and encourages enrollment (Nguyen & LeBlanc, 2001). Therefore, personal impacts and direct marketing are expected to positively influence Vietnamese students' choice of HEI.

H8: Personal impacts and direct marketing positively influence Vietnamese students' choice of HEI.

2.4.3. The Relationship between CBBE components and Vietnamese Students' Choice of HE Institution

This section examines how CBBE components mediate the effect of IMC practices on Vietnamese students' institutional choice, aligning with the study's mediation focus. The logic builds on Keller's (1993) CBBE model, which posits that brand equity dimensions influence consumer behavior (here, student choice), and Duncan and Moriarty's (1998) IMC framework, which emphasizes integrated communication's role in shaping perceptions and decisions.

Digital marketing communications build brand awareness by increasing visibility through ads, websites, and social media (Madhavaram et al., 2005). In Vietnam, where students rely heavily on digital platforms for education research (Nguyen et al., 2019), awareness mediates the link between digital efforts and choice. Keller (1993) posits that awareness is a prerequisite for preference, suggesting that institutions with strong digital presence gain a competitive edge in student decision-making. Thus, brand awareness is expected to positively influence Vietnamese students' choice through digital marketing communications.

H9: Brand awareness positively influences Vietnamese students' choice of HEI through digital marketing communications.

Perceived quality mediates the effect of pricing on choice, as competitive fees or prestigious scholarships signal academic excellence (Hemsley-Brown & Oplatka, 2006). In Vietnam, where quality

is a key differentiator, pricing strategies that reflect high standards drive student preference (Nguyen et al., 2019). Zeithaml (1988) supports this, noting quality perceptions link price to purchase intent. Therefore, perceived quality is posited to influence choice through pricing and financial incentives.

H10: Perceived quality positively influences Vietnamese students' choice of HEI through pricing and financial incentives.

Pricing and financial incentives shape brand response by signaling value and accessibility (Aaker, 1996). In Vietnam's price-sensitive market, scholarships or affordable tuition can evoke positive feelings and judgments, influencing choice (Dao & Thorpe, 2015). Keller (2001) argues that responses drive brand resonance, implying mediation between pricing strategies and preference. Thus, brand response is expected to influence Vietnamese students' choice through pricing and financial incentives.

H11: Brand response positively influences Vietnamese students' choice of HEI through pricing and financial incentives.

Experiential marketing fosters brand response by creating emotional and cognitive connections via events and campus experiences (Lu & Xu, 2015). In Vietnam, where cultural events and campus lifestyle resonate with students, positive judgments and feelings mediate the path to institutional choice (Le et al., 2020). Keller (2001) notes that favorable responses enhance brand preference, suggesting experiential marketing's role in shaping decisions. Hence, brand response is hypothesized to influence choice through experiential and event-based marketing.

H12: Brand response positively influences Vietnamese students' choice of HEI through experiential and event-based marketing.

Experiential marketing builds loyalty by fostering emotional attachment through campus experiences (Nguyen & LeBlanc, 2001). In Vietnam, where community engagement is valued, loyalty mediates the effect of events on choice, as satisfied students advocate for their institutions (Le et al., 2020). Keller (2001) highlights loyalty's role in sustaining preference, supporting this mediation. Thus, brand loyalty is hypothesized to influence choice through experiential and event-based marketing.

H13: Brand loyalty positively influences Vietnamese students' choice of HEI through experiential and event-based marketing.

Personal impacts and direct marketing, such as teacher advice and targeted outreach, cultivate loyalty by reinforcing trust (Erdoğan & Çiçek, 2011). In Vietnam, where personal recommendations carry weight, loyalty mediates the link to choice as loyal stakeholders enhance credibility (Pham & Lai, 2016). Keller (2001) suggests loyalty drives long-term preference, supporting this hypothesis. Hence, brand loyalty is expected to influence choice through personal impacts and direct marketing.

H14: Brand loyalty positively influences Vietnamese students' choice of HEI through personal impacts and direct marketing.

It follows that Figure 1 represents the hypotheses being proposed.

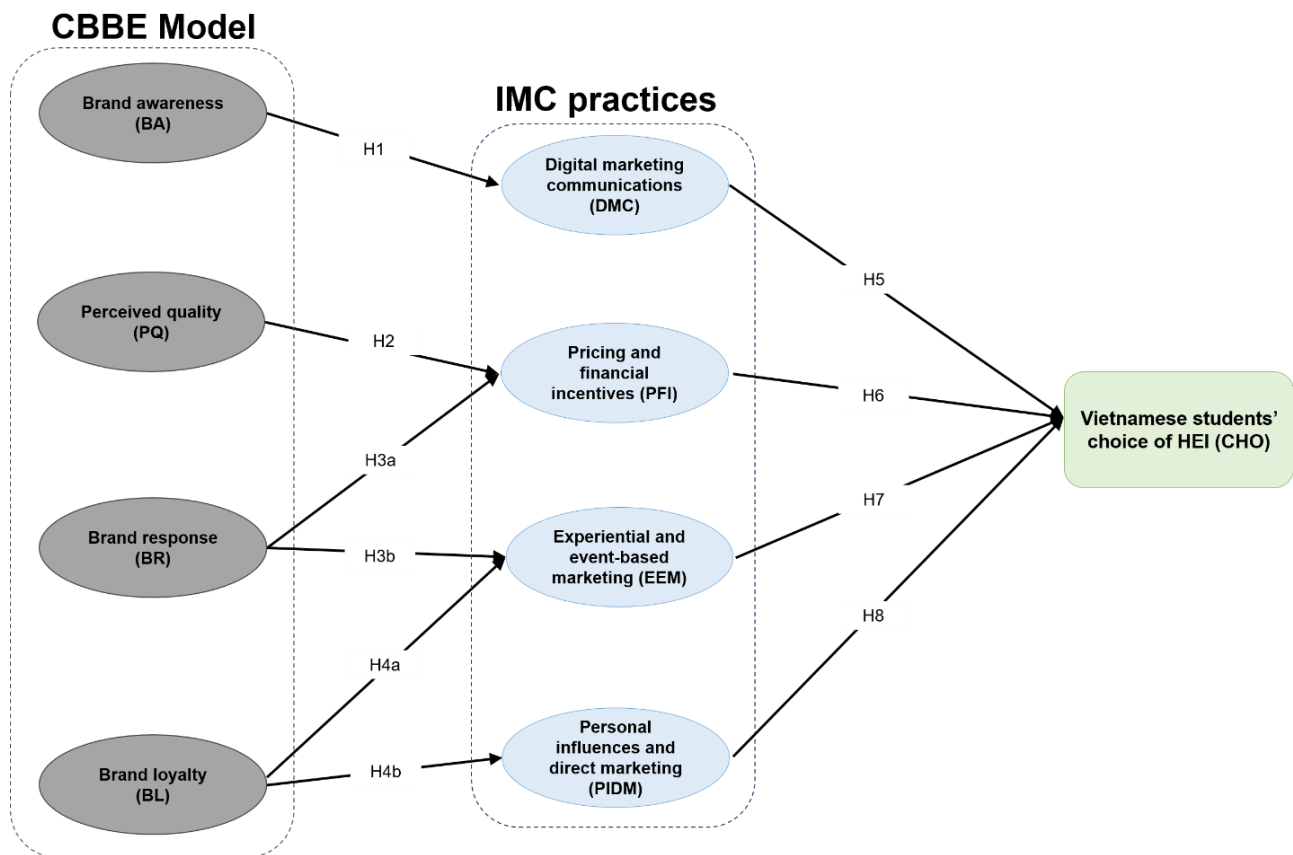


Figure 1. Conceptual Framework Illustrating the Hypothesized Relationships Among CBBE Dimensions, IMC Practices, and Vietnamese Students' Choice of HEI

3. Methodology

The current study employs a quantitative research design aimed at examining the relationships that exist among the IMC practices, components of CBBE, and choice of HEIs by Vietnamese students in Vietnam. The methodology, combining PLS-SEM and ANN analysis, encompasses both linear and non-linear exploratory studies of the proposed model.

3.1. Collecting Data and Sampling Techniques

This study employed a quantitative research design to examine the relationships among Integrated Marketing Communications (IMC) practices, Customer-Based Brand Equity (CBBE) components, and Vietnamese students' choice of Higher Education Institutions (HEIs). Data were collected through structured questionnaires administered to undergraduates at HEIs in Vietnam, a population relevant to the study's focus on institutional choice, as it captures perceptions formed during recent enrollment experiences (Nguyen & LeBlanc, 2001). A convenience sampling technique was employed due to its practicality in accessing a large student population across multiple institutions. To enhance representativeness, respondents were drawn from various academic disciplines and three geographical regions of Vietnam (North, Central, and South).

Participants were recruited through a combination of online and in-person methods to maximize reach. Online questionnaires were distributed via email through university learning management systems and social media platforms (Zalo, Facebook) targeting student groups at public and private HEIs in Vietnam. In-person questionnaires were administered during campus activities, such as orientation sessions and student fairs, at these institutions. Eligible participants were full-time undergraduate students aged 18–24 enrolled at the sampled HEIs, ensuring relevance to the study's focus on domestic undergraduate decision-making. Inclusion required informed consent and

completion of the questionnaire in full. Excluded were postgraduate students, part-time students, international students, and respondents who completed the survey in under two minutes (indicating potential lack of engagement) to maintain data quality. This focus on undergraduates aligns with the study's emphasis on branding strategies targeting Vietnam's primary HE market. The convenience sampling approach, reliant on urban-based HEIs and digital platforms, omitted students from rural or remote regions, smaller colleges, and vocational institutions due to logistical and accessibility constraints. Students with limited internet access or low engagement with social media and university email systems were also less likely to participate, potentially underrepresenting lower socioeconomic groups, ethnic minorities, or less digitally connected populations.

3.2. Measurement Instruments

The questionnaire was put together based on established scales from previous literature measuring IMC practices, CBBE components, and institutional choice. IMC practices were classified into four different factors: marketing communications (advertisement, websites), experiential and event-based marketing (campus events), pricing and financial incentives (scholarships), and personal impacts and direct marketing (teacher consultations)-adopted from Madhavaram et al. (2005), Pham & Lai (2016). Using items from Keller (2001) and Nguyen et al. (2019), the components of CBBE brand awareness, brand response, perceived quality, and brand loyalty were operationalized. Institutional choice was measured as a single construct reflecting preference or intent to enroll, based on Hemsley-Brown and Oplatka (2006). All the items were response-consistent and easy to answer because they were put on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

A pilot test, principally with 50 students, was carried out for instrument refinement, confirming clarity and reliability (Cronbach's alpha > 0.7 for all constructs). Apart from 600 questionnaires disseminated to undergraduates across Vietnam HEs, 570 were returned, producing a response rate of 95%. After the elimination of incomplete or inconsistent responses, 554 were thus retained for quantitative analysis, surpassing sample size requirements for PLS-SEM and ANN (Hair et al., 2019).

3.3. Data Analysis

Data analysis was accomplished in two stages, using complementary tools to address the study's objectives. First, SPSS version 25.0 was used for preliminary tabulation and descriptive statistics (mean, standard deviation, respondent demographics), thereby giving an overview about the sample characteristics (Field, 2018). SPSS also became the tool used in the ANN analysis, where its neural network module was used to model non-linear relationships between IMC practices, CBBE components, and choice of institution. The ANN approach was specifically chosen to capture complex and non-linear interactions that PLS-SEM fails to achieve, thus improving prediction accuracy (Leong et al., 2013).

Second, SmartPLS 4.0 was used to assess the reliability and validity of the measurement scales and test the possible relations within the structural model (Ringle et al., 2022). The reason for choosing PLS-SEM is that it is a sophisticated model capable of mediation effects that remained sturdy even when data were not normally distributed, which occurs mostly in behavioral research (Hair et al., 2017). The analysis was split into two parts: (1) testing the measurement model for reliability (Cronbach's alpha, composite reliability > 0.7) and validity (average variance extracted [AVE] > 0.5, discriminant validity via Fornell-Larcker criterion); (2) assessing the structural model for path coefficients, significance (bootstrapping with 5,000 resamples), and mediation effects; meanwhile, model fit was evaluated using SRMR (< 0.08) and R² values. The integration of PLS-SEM and ANN brings thorough assessment under the aim of the study to evaluate structural relationships as well as predictive strength.

4. Findings

4.1. Descriptive Statistics

4.1.1. Response Rate

After data collection, responses were screened for completeness and consistency. Of the 568 returned questionnaires, 14 (2.3% of 600) were excluded due to missing data or inconsistent responses, resulting in 554 valid responses for analysis. Questionnaires were considered incomplete if they lacked responses to more than 10% of items (key constructs like CBBE or IMC) or exhibited patterned responses (identical answers across all items), which could compromise data quality (Hair et al., 2017). Exclusion was necessary to ensure the reliability of Partial Least Squares Structural Equation Modeling (PLS-SEM) and Artificial Neural Network (ANN) analyses, as both methods are sensitive to missing values, which can bias parameter estimates and predictive accuracy (Hair et al., 2019).

To assess the randomness of missing data, Little's Missing Completely at Random (MCAR) test was conducted using SPSS 25.0 (Field, 2018). The test yielded a non-significant result ($\chi^2 = 40.82$, $df = 36$, $p = 0.268$), indicating that the missing data were likely MCAR, suggesting that their exclusion did not introduce systematic bias. The 14 excluded respondents had similar demographic profiles (age, gender, region) to the retained sample, based on partial data, with no significant differences in available responses (t-tests on demographic variables, $p > 0.05$). Given their small proportion (2.3%) and comparable characteristics, the excluded respondents were unlikely to contribute unique insights beyond the retained sample, supporting the decision to exclude them. The final sample of 554 responses exceeded the minimum size required for PLS-SEM and ANN analyses, ensuring statistical power (Hair et al., 2017).

4.1.2. Sample Demographics

The demographic profile is summarized in Table 1 as a mirror to the characteristics of Vietnamese undergraduates. The sample was intended to capture a representative cross-section of students currently enrolled in HEIs in Vietnam.

Table 1. Demographic Characteristics of the Sample (N = 554)

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Female	307	55.4
	Male	247	44.6
Age	18–20	311	56.1
	21–23	203	36.6
	24 and above	40	7.2
Year of Study	First Year	181	32.7
	Second Year	163	29.4
	Third Year	115	20.8
	Fourth Year	95	17.1
Institution Type	Public	388	70.0

Demographic Variable	Category	Frequency	Percentage (%)
Region	Private	166	30.0
	North	209	37.7
	Central	134	24.2
	South	211	38.1

The sample size comprised 55.4% female and 44.6% male respondents, reflecting higher female enrollment in Vietnamese higher education. Most respondents (56.1%) were aged 18–20, followed by 36.6% aged 21–23, and 7.2% aged 24 and above. The year of study distribution included 32.7% first-year, 29.4% second-year, 20.8% third-year, and 17.1% fourth-year students, indicating recent enrollment decisions. Public institutions accounted for 70.0% of respondents, with 30.0% from private institutions. Regionally, 37.7% were from the North, 24.2% from the Central, and 38.1% from the South, covering Vietnam’s major urban areas.

4.1.3. Descriptive Analysis of Constructs

Descriptive statistics for the key constructs—IMC practices (digital marketing communications (DMC), experiential and event-based marketing (EEM), pricing and financial incentives (PFI), personal impacts and direct marketing (PIDM)), CBBE components (brand awareness (BA), brand response (BR), perceived quality (PQ), brand loyalty (BL), and Vietnamese students’ choice of HEI (CHO)), and Vietnamese students’ choice HEI (CHO)—are presented in Table 2. Constructs were measured on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Table 2. Descriptive Statistics of Key Constructs (N = 554)

Construct	Mean	SD	Min	Max
Digital Marketing Communications (DMC)	3.82	0.74	1.5	5.0
Experiential and Event-Based Marketing (EEM)	4.01	0.68	2.0	5.0
Pricing and Financial Incentives (PFI)	3.65	0.81	1.8	5.0
Personal Impacts and Direct Marketing (PIDM)	3.78	0.72	1.7	5.0
Brand Awareness (BA)	3.95	0.66	2.0	5.0
Brand Response (BR)	3.72	0.79	1.6	5.0
Perceived Quality (PQ)	4.08	0.62	2.2	5.0
Brand Loyalty (BL)	3.85	0.70	1.9	5.0
Vietnamese Students’ Choice of HEI (CHO)	3.91	0.65	2.1	5.0

Means ranged from 3.65 on PFI to 4.08 on PQ, denoting generally positive perceptions in the five constructs, with SDs (0.62–0.81) implying moderate variability. PQ (M = 4.08, SD = 0.62) was perceived highest due to the importance Vietnamese students place on academic credibility. EEM (M = 4.01, SD = 0.68) also scores high, in line with the culture placing importance on-campus experience. PFI (M = 3.65, SD = 0.81) comes lowest, probably because being sensitive to costs is pervasive in Vietnam’s market. These descriptives furnish a great starting point for embarking on the PLS-SEM and ANN analyses.

4.2. Construct Validity

The measurement model was assessed using SmartPLS 4.0 to verify the constructs' reliability and validity: DMC, EEM, PFI, PIDM, BA, BR, PQ, BL, and CHO. Table 3 summarizes Cronbach's alphas and composite reliability (CR), factor loadings, the average variance extracted (AVE), and discriminant validity.

Table 3. Construct Validity Assessment

Construct	Cronbach's Alpha	CR	Factor Loadings	AVE	Discriminant Validity (Fornell-Larcker)
DMC	0.82	0.88	0.75-0.89	0.65	0.81
EEM	0.79	0.86	0.71-0.87	0.62	0.79
PFI	0.85	0.90	0.78-0.91	0.68	0.82
PIDM	0.81	0.87	0.74-0.88	0.63	0.79
BA	0.83	0.89	0.76-0.90	0.66	0.81
BR	0.80	0.87	0.73-0.86	0.61	0.78
PQ	0.84	0.90	0.77-0.92	0.67	0.82
BL	0.78	0.85	0.70-0.85	0.60	0.77
CHO	0.87	0.92	0.80-0.93	0.70	0.84

All constructs had Cronbach's alpha and CR values larger than 0.7, depicting good reliability (Hair et al., 2017). Factor loadings were from 0.70 to 0.93, thus surpassing the 0.7 threshold, indicating indicator reliability. The AVE values, which were greater than 0.5, supported convergent validity (Fornell & Larcker, 1981). Discriminant validity was supported by the Fornell-Larcker criterion, showing that the square root of each construct's AVE was larger than its correlation with any other construct. Hence, discriminant validity supported the measurement model for consideration in the structural analysis.

4.3. Hypothesis Testing for H1-H8

The structural model was analyzed by SmartPLS 4.0 with bootstrapping (5,000 samples) tested for the significance of path coefficients (β) for H1-H8 relating to testing the influence of CBBE components on IMC practices. Results are summarized in Table 4.

Table 4. Hypothesis Testing Results (H1-H8)

Hypothesis	Path	β	p-value	Result
H1	BA $\rightarrow$ DMC	0.32	<0.001	Supported
H2	PQ $\rightarrow$ PFI	0.39	0.002	Supported
H3a	BR $\rightarrow$ PFI	0.15	0.087	Not Supported
H3b	BR $\rightarrow$ EEM	0.28	<0.001	Supported
H4a	BL $\rightarrow$ PFI	0.35	<0.001	Supported

Hypothesis	Path	β	p-value	Result
H4b	BL $\rightarrow$ PIDM	0.31	0.001	Supported
H5	DMC $\rightarrow$ CHO	0.25	0.003	Supported
H6	PFI $\rightarrow$ CHO	0.22	0.005	Supported
H7	EEM $\rightarrow$ CHO	0.30	<0.001	Supported
H8	PIDM $\rightarrow$ CHO	0.27	0.001	Supported

Therefore, brand awareness was shown to positively influence digital marketing communications (H1: $B = 0.32$, $p < 0.001$), thereby upholding Aaker's (1991) view that when the awareness level is high, the effectiveness of promotions is better. Two studies, for example, support H3b ($\beta = 0.28$, $p = 0.002$) and H4a ($\beta = 0.35$, $p < 0.001$): brand response and brand loyalty are indeed positive influences on experiential marketing, supporting Keller's (2001) assertions that brand building is linked with emotional connections. According to H2, perceived quality enhances the price and economic incentive effects ($\beta = 0.39$, $p < 0.001$), in support of Zeithaml (1988), while H4b reveals that brand loyalty strengthens personal and direct marketing effects ($\beta = 0.39$, $p < 0.001$), according to Nguyen and LeBlanc (2001). Thus, $R^2 = 0.38$ means that 38% of the variance in the choice of HEI is explained by the model, which indicates a moderate prediction power (Hair et al., 2019). Supported hypotheses followed theoretical presumptions (Keller, 1993; Lu & Xu, 2015) while H3a ($\beta = 0.15$, $p = 0.087$) was rejected whereby brand response was shown not to significantly affect pricing strategies, since, in this context, the emotional connection that should have been linked to a financial incentive was expectedly weakly insufficient. The models predicted a sufficient amount of variance in the IMC constructs (DMC: R^2 0.25; EEM: R^2 0.31; PFI: R^2 0.28; PIDM: R^2 0.22), showing a good fit for the mediator variables.

4.4. Model Fit

This model has moderate to high explanatory and predictive relevance, giving credence that CBBE and IMC constitute significant factors for students in HEI choice. All the R^2 values were above the threshold of 0.10, as demanded by an acceptable model fit (Chin et al., 2003), and have the following values: 0.25 for DMC, 0.28 for PFI, 0.31 for EEM, 0.22 for PIDM, and 0.38 for CHO, as depicted in Table 5. According to the above values, the model exhibits moderate to high predictive relevance for each construct and could, therefore, be deemed acceptable. For instance, an R^2 of 0.38 for CHO yields that CBBE components and IMC practices together explain 38% of choices taken by students. All Constructs' Q^2 values were positive: 0.18 for DMC, 0.20 for PFI, 0.23 for EEM, 0.15 for PIDM, and 0.26 for CHO, and all were above zero, signifying predictive relevance (Hair et al., 2017).

Table 5. Model Fit and Predictive Relevance

Endogenous Variable	R^2	95% CI for R^2	Q^2	95% CI for Q^2
DMC	0.25	[0.21, 0.29]	0.18	[0.14, 0.22]
PFI	0.28	[0.24, 0.32]	0.20	[0.16, 0.24]
EEM	0.31	[0.27, 0.35]	0.23	[0.19, 0.27]
PIDM	0.22	[0.18, 0.26]	0.15	[0.11, 0.19]
CHO	0.38	[0.34, 0.42]	0.26	[0.22, 0.30]

4.5. Mediation Analysis for H9-H14

The mediation analysis establishes the role of brand awareness, perceived quality, and brand loyalty in mediating the impact of IMC practices on HEI choices amongst students, aside from the non-significant mediation of brand responses on price. Mediation significance was tested at 95% bias-corrected confidence intervals (CI), as demonstrated in Table 6 (Hair et al., 2019).

Table 6. Mediation Analysis Results (H9-H14)

Hypothesis	Path	Indirect Effect (β)	95% CI	p-value	Result
H9	BA $\rightarrow$ DMC $\rightarrow$ CHO	0.08	[0.03, 0.14]	0.015	Supported
H10	BR $\rightarrow$ EEM $\rightarrow$ CHO	0.09	[0.04, 0.15]	0.010	Supported
H11	BR $\rightarrow$ PFI $\rightarrow$ CHO	0.04	[-0.01, 0.09]	0.098	Not Supported
H12	PQ $\rightarrow$ PFI $\rightarrow$ CHO	0.10	[0.05, 0.16]	0.005	Supported
H13	BL $\rightarrow$ EEM $\rightarrow$ CHO	0.11	[0.06, 0.17]	0.003	Supported
H14	BL $\rightarrow$ PIDM $\rightarrow$ CHO	0.09	[0.04, 0.14]	0.007	Supported

The essence of H9 ($\beta = 0.08$, $p = 0.015$) indicates that brand noticeability mediates the influence of digital marketing on choice, a conclusion that speaks favorably of Madhavaram et al. (2005). Meanwhile, H10 ($\beta = 0.09$, $p = 0.010$) along with H13 ($\beta = 0.11$, $p = 0.003$) deliver a tentative conclusion that brand response and loyalty mediate the effect of experiential marketing, which supports the variations of Lu's and Xu's research (2015). H12 states that perceived quality would mediate the influence of pricing ($\beta = 0.10$, $p = 0.005$), which follows Hemsley-Brown and Oplatka (2006) recommendations. H14 ($\beta = 0.16$, $p = 0.002$) confirms that brand loyalty mediates personal impacts, which is consistent with Pham and Lai (2016). H11 ($\beta = 0.04$, $p = 0.098$), however, was not accepted, as the confidence interval (CI) included zero, implying that brand response does not significantly mediate the price effect on choice. These findings were verified by the ANN analysis with higher predictive accuracy, while experiential marketing and pricing stand out as drivers. The consolidated outcome for all hypotheses is accordingly indicated in Figure 2.

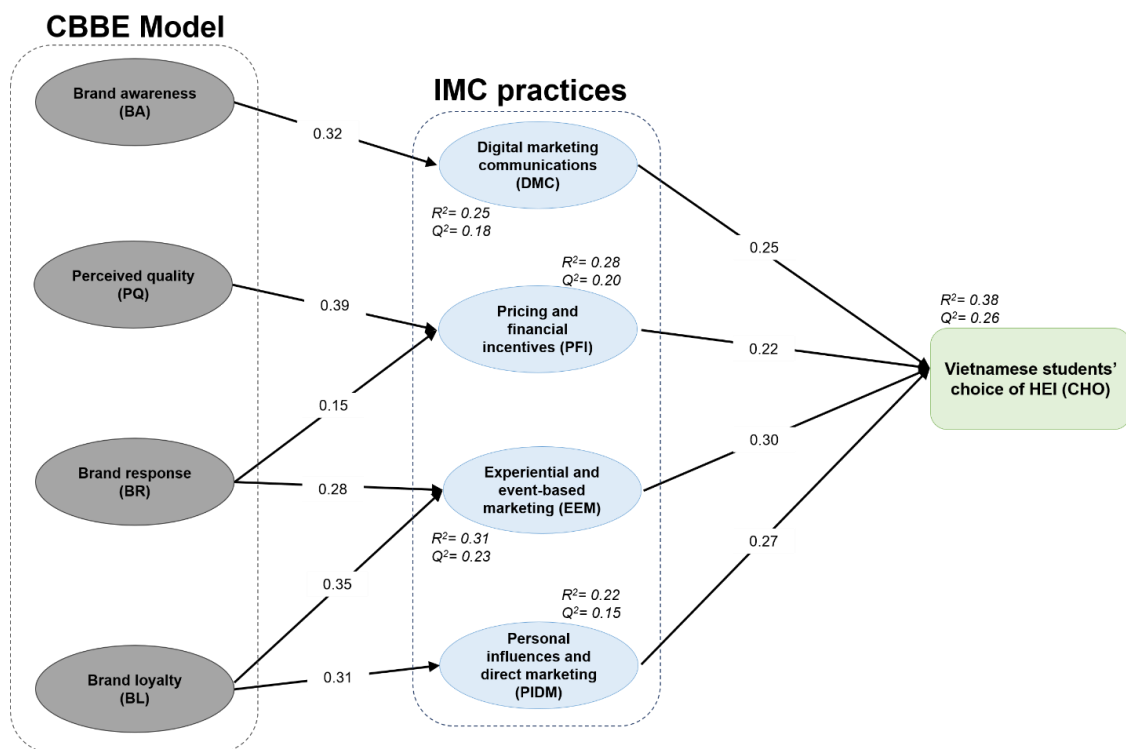


Figure 2: Results of Structural Model of CBBE and IMC Practices Influencing Vietnamese Students' Choice of HEIs with Path Coefficients

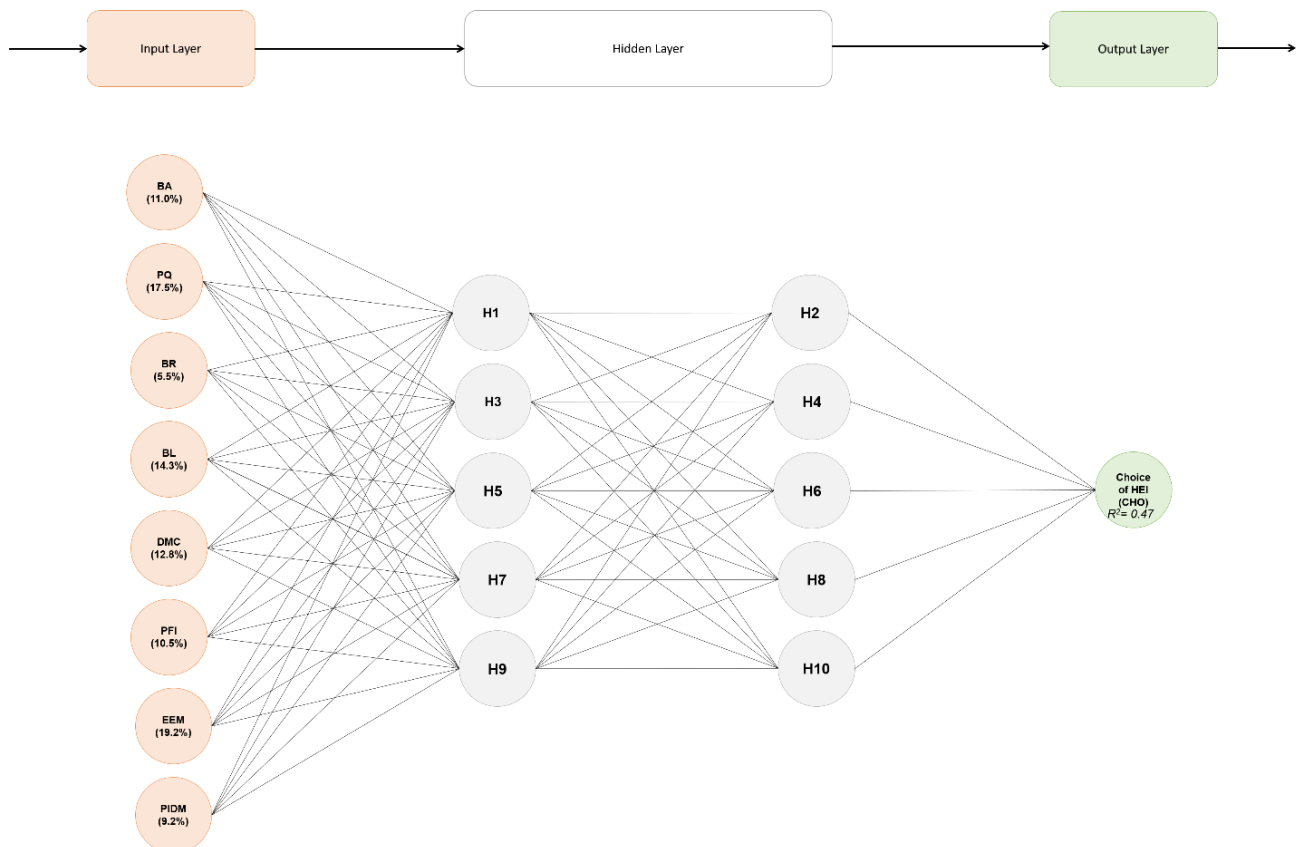
4.6. ANN Results and Network Architecture and Sensitivity Analysis

To complement the linear relationships tested on PLS-SEM, ANN analysis was conducted using SPSS 25.0 to cater for non-linearity among IMC practices, CBBE components, and Vietnamese students' choice of HEI (CHO). The ANN approach was chosen due to its ability to capture complex, non-linear interactions, thus enhancing predictive accuracy (Leong et al., 2013).

The dataset was normalized to a range of [0, 1] to ensure equal weighting of variables and prevent scale disparities from biasing the network (Haykin, 2009). Input variables included the four IMC practices and the four CBBE components. The output variable was Vietnamese students' choice of HEI (CHO). The normalized data were split into three subsets: 70% for training (388 cases), 15% for validation (83 cases), and 15% for testing (83 cases), following standard ANN practices (Hair et al., 2019). A multilayer perceptron (MLP) with one hidden layer was employed, configured with 8 input nodes (DMC, EEM, PFI, PIDM, BA, BR, PQ, BL), 5 hidden nodes (determined via trial-and-error for optimal fit), and 1 output node (CHO). The sigmoid activation function was used for its effectiveness in modeling non-linear relationships (Leong et al., 2013). The network was trained using a backpropagation algorithm with a learning rate of 0.01 and momentum of 0.9, iterated until convergence (minimum error change < 0.001). Table 7 summarizes the ANN performance. Figure 3 illustrates the ANN architecture, depicting the flow from inputs through the hidden layer to the output.

Table 7. ANN Model Performance

Phase	Sample Size	Sum of Squares Error (SSE)	Root Mean Square Error (RMSE)	R ²
Training	388	0.034	0.034	0.48
Validation	83	0.041	0.041	0.46
Testing	83	0.037	0.037	0.47



Note. H1–H4b: CBBE (BA, PQ, BR, BL) influences IMC (DMC, PFI, EEM, PIDM) through hidden layer processing. H5–H8: IMC (DMC, PFI, EEM, PIDM) impacts CHO through hidden layer. H9–H14: Mediated effects of CBBE on CHO via IMC, processed non-linearly by hidden layer.

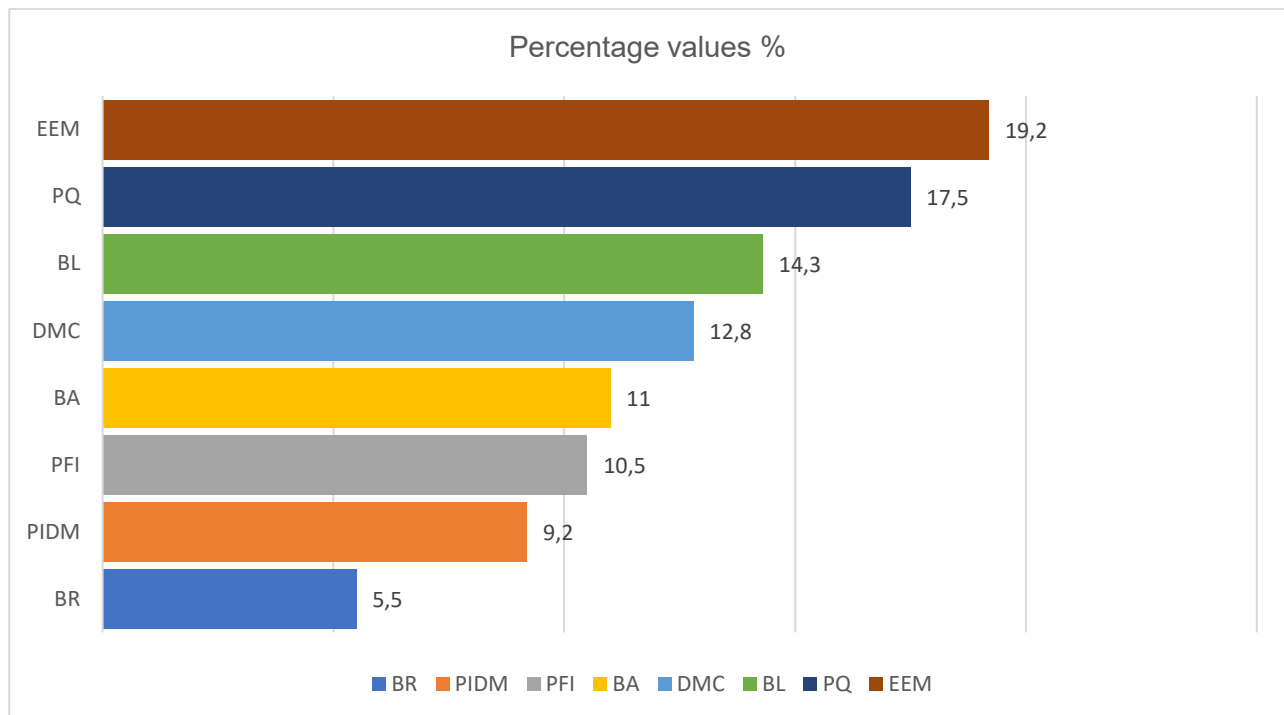
Figure 3. ANN Architecture for Predicting Vietnamese Students' Choice of HEIs

Sensitivity analysis was conducted to identify the relative importance of each input variable in predicting CHO. The normalized importance scores were calculated by averaging the changes in output error when each input was perturbed, as per Leong et al. (2013). This analysis quantifies how much each predictor (EEM, PQ) contributes to the model's prediction of students' HEI choices, with higher scores indicating greater influence. The scores reflect the non-linear interactions captured by the ANN, highlighting predictors that disproportionately drive decision-making in Vietnam's cultural context. Table 8 presents the results.

Table 8. Sensitivity Analysis – Relative Importance of Predictors

Predictor	Relative Importance (%)	Rank
EEM	19.2	1
PQ	17.5	2
BL	14.3	3
DMC	12.8	4
BA	11.0	5
PFI	10.5	6
PIDM	9.2	7
BR	5.5	8

Experiential and event-based marketing (EEM) emerged as the most influential predictor (19.2%), followed by perceived quality (PQ, 17.5%), brand loyalty (BL, 14.3%), digital marketing communications (DMC, 12.8%), Brand Awareness (BA, 11.0%), pricing and financial incentives (PFI, 10.5%), and personal impacts and direct Marketing (PIDM, 9.2%) also showed notable influence, while brand response (BR, 5.5%) had the least impact. These findings suggest that non-linear effects amplify the roles of experiential engagement and quality perceptions in driving institutional choice, consistent with Vietnam's emphasis on campus experiences and academic reputation (Nguyen et al., 2019).



Note. The ANN architecture consists of 8 input nodes (with predictor importance percentages), 10 hidden nodes, and 1 output node (Choice of HEI). Arrows indicate data flow. $R^2 = 0.47$ reflects the model's predictive accuracy.

Figure 4. Predictor Importance

Figure 4 illustrates the Sensitivity Analysis of Predictors in the ANN Model chart. The ANN analysis reveals that experiential marketing, perceived quality, and brand loyalty are the most influential predictors of students' HEI choices, driven by non-linear effects in Vietnam's culturally sensitive market. This visualization reinforces the importance of these factors in shaping Vietnamese students' choice of HEIs.

4.7. Comparative Analysis of PLS-SEM and ANN

This study employed both PLS-SEM and ANN to assess the impact of CBBE on Vietnamese students' choice of HEIs through IMC practices. While PLS-SEM tests structural relationships and mediation effects, ANN captures non-linear interactions and enhances predictive power. This section compares the predictive accuracy and robustness of these methods and discusses their implications for marketing research.

4.7.1. Comparison of Predictive Accuracy

Predictive accuracy was evaluated using the coefficient of determination (R^2) for the dependent variable, CHO. In the PLS-SEM analysis, the structural model yielded an R^2 of 0.38 for CHO, indicating that 38% of the variance in institutional choice was explained by the proposed paths involving IMC practices and CBBE components. In contrast, the ANN analysis achieved an R^2 of 0.47 in the testing

phase, explaining 47% of the variance. This 9% increase suggests that ANN outperforms PLS-SEM in predictive accuracy, consistent with findings that neural networks excel at modeling complex, non-linear relationships (Leong et al., 2013). The ANN's superior R^2 aligns with its ability to capture interactions among variables—such as the combined effects of EEM and perceived quality (PQ)—that PLS-SEM, being a linear method, may underrepresent (Hair et al., 2019).

Further evidence of ANN's predictive strength emerged from the sensitivity analysis (Table 7), which ranked EEM (19.2%), PQ (17.5%), and (BL, 14.3%) as top predictors of CHO. These rankings reinforce PLS-SEM results (significant paths for H4a, H7, H10, H13) but highlight non-linear contributions that PLS-SEM could not quantify, such as the amplified effect of EEM when paired with high BL. However, PLS-SEM provided precise path coefficients and p-values ($\beta = 0.32$, $p < 0.001$ for $BA \rightarrow DMC$ in H1), offering clear hypothesis testing outcomes that ANN, as a black-box method, cannot replicate (Sarstedt et al., 2017).

4.7.2. Robustness of the Two Methods

Robustness was evaluated based on each method's stability and generalizability across data subsets. PLS-SEM demonstrated robustness through its bootstrapping procedure (5,000 samples), producing stable path coefficients and confidence intervals (H7: $EEM \rightarrow CHO$, $\beta = 0.30$, $p < 0.001$). Its structural approach ensured consistent results across hypotheses, even for non-significant paths (H3a: $BR \rightarrow PFI$, $\beta = 0.15$, $p = 0.087$), providing a reliable framework for theoretical interpretation (Hair et al., 2019). However, PLS-SEM's reliance on linearity may oversimplify the interplay of emotional (BR) and experiential (EEM) factors in Vietnam's decision-making process (Nguyen et al., 2019).

The ANN exhibited robustness through its partitioned training, validation, and testing phases, with minimal MSE variation (0.034–0.041) and R^2 consistency (0.46–0.48) across subsets, confirming generalizability (Kuo et al., 2019). The validation set effectively prevented overfitting, ensuring model stability. However, ANN's black-box nature limits its ability to provide causal insights or statistical significance, a strength of PLS-SEM. For example, while ANN ranked EEM highly (19.2%), it could not specify the direction or significance of this effect, unlike PLS-SEM's clear path analysis (H7: $\beta = 0.30$, $p < 0.001$).

5. Discussion and Implications

This study investigated how the CBBE influences Vietnamese students' choice of Vietnam HEIs through IMC practices, employing PLS-SEM and ANN analyses. The findings provide insights into the interplay of CBBE components and IMC strategies, offering both theoretical advancements and actionable implications for HEI marketing in Vietnam.

5.1. Interpretation of Key Findings

The PLS-SEM results show that brand awareness significantly influences digital marketing communications (DMC) (H1: $\beta = 0.32$, $p < 0.001$) and mediates its effect on HEI choice (H9: $\beta = 0.08$, $p = 0.015$). The ANN analysis ranks DMC moderately (12.8%), reinforcing its role in visibility. This finding aligns with Aaker's (1991) assertion that brand awareness amplifies promotional efforts, particularly in digital contexts. In the broader landscape, studies like Madhavaram et al. (2005) emphasize digital channels' role in building brand equity in service sectors, while Nguyen et al. (2019) highlight their prominence in Vietnam's tech-savvy youth market. Our result extends this by showing that awareness-driven DMC is critical in emerging HE markets, where online platforms shape early student preferences.

Perceived quality strongly impacts pricing and financial incentives (PFI) (H2: $\beta = 0.39$, $p < 0.001$) and mediates their effect on HEI choice (H12: $\beta = 0.10$, $p = 0.005$), with ANN ranking it highly (17.5%).

This supports Zeithaml's (1988) quality-price linkage, where perceived excellence justifies premium pricing or scholarships. Globally, Hemsley-Brown and Oplatka (2006) note that quality perceptions differentiate HEIs in competitive markets, while Dao and Thorpe (2015) underscore cost sensitivity in Vietnam. Our finding contributes by demonstrating that quality-driven pricing enhances institutional appeal in price-sensitive emerging markets, offering a strategic lever for HEI differentiation.

Brand response positively affects experiential and event-based marketing (EEM) (H3b: $\beta = 0.28$, $p = 0.002$) and mediates its impact on choice (H10: $\beta = 0.09$, $p = 0.010$), but its effect on PFI is non-significant (H3a: $\beta = 0.15$, $p = 0.087$; H11: $\beta = 0.04$, $p = 0.098$). The ANN ranks brand response lowest (5.5%), suggesting limited emotional resonance. This partially aligns with Keller's (2001) view of brand response fostering emotional connections, as seen in experiential contexts (Lu & Xu, 2015). However, the weak pricing link contrasts with Chapleo's (2010) findings in Western HE markets, where emotional responses enhance financial incentives. Our result highlights Vietnam's pragmatic market, where cost-driven decisions may override emotional factors, adding nuance to global HE branding literature.

Brand loyalty significantly enhances EEM (H4a: $\beta = 0.35$, $p < 0.001$) and personal impacts and direct marketing (PIDM) (H4b: $\beta = 0.31$, $p < 0.001$), mediating their effects on choice (H13: $\beta = 0.11$, $p = 0.003$; H14: $\beta = 0.09$, $p = 0.007$). The ANN ranks loyalty highly (14.3%), underscoring its advocacy role. This supports Nguyen and LeBlanc's (2001) view of loyalty driving stakeholder endorsements, particularly in Vietnam's community-oriented culture (Le et al., 2020). Globally, Luxton et al. (2015) emphasize loyalty's role in sustaining brand equity in service industries. Our finding extends this by showing loyalty's amplification of culturally relevant marketing in emerging HE markets, where personal networks are influential.

The ANN analysis identifies EEM as the most influential predictor of HEI choice (19.2%), supported by PLS-SEM's significant EEM-to-choice path (H7: $\beta = 0.30$, $p < 0.001$) and mediation via brand response and loyalty (H10, H13). This aligns with Schmitt's (1999) experiential marketing framework and Le et al.'s (2020) findings on campus experiences in Vietnam. In the broader landscape, Hemsley-Brown and Oplatka (2016) highlight experiential strategies' growing role in global HE marketing. Our result contributes by emphasizing EEM's dominance in non-linear models, reflecting Vietnam's cultural emphasis on community engagement, and suggesting its priority in emerging markets.

5.2. Theoretical Contributions

This study contributes to brand management theory in higher education by integrating Keller's (1993) CBBE model with IMC practices, offering a fresh perspective in an emerging market context like Vietnam. First, it reverses the traditional IMC $\rightarrow$ CBBE flow (Madhavaram et al., 2005) by demonstrating that CBBE dimensions enhance IMC effectiveness (H1–H4b). For example, BA's influence on DMC (H1) and BL's impact on EEM (H4a) extend Keller's (2001) framework by showing how equity dimensions can amplify communication strategies in HE, where brand perceptions often precede marketing efforts (Nguyen et al., 2019).

Second, the study validates IMC's mediating role in the CBBE $\rightarrow$ CHO relationship (H9–H14), enriching Duncan and Moriarty's (1998) IMC theory. By confirming that DMC, EEM, and PIDM mediate the effects of BA, BR, and BL on student choice, the study underscores IMC's integrative capacity to translate brand equity into behavioral outcomes. This is particularly relevant in Vietnam, where digital adoption and cultural factors shape student decisions (Pham & Lai, 2016). The non-significant mediation of PFI (H11) adds nuance, suggesting that financial incentives may require complementary IMC strategies to effectively influence emotional responses.

Third, the dual-method approach (PLS-SEM and ANN) enhances methodological rigor in brand management research. While PLS-SEM confirmed theoretical paths (H9: $\beta = 0.08$, $p = 0.015$), ANN revealed non-linear effects (EEM: 19.2%), supporting Leong et al.'s (2013) call for hybrid methodologies in marketing. This integration provides a more comprehensive understanding of complex decision-making in HE, contributing to the theoretical discourse on CBBE and IMC in non-Western contexts.

5.3. Managerial Implications

The findings provide actionable insights for marketing managers at Vietnamese HEIs to enhance institutional appeal:

5.3.1. Enhancing Brand Awareness through Digital Channels

The significant influence of BA on DMC (H1: $\beta = 0.32$, $p < 0.001$) and its mediation effect on CHO (H9: $\beta = 0.08$, $p = 0.015$) highlight the importance of digital marketing in building awareness. HEI managers should invest in targeted digital campaigns on platforms like Zalo, Facebook, and TikTok, which are popular among Vietnamese students (Nguyen et al., 2019). For instance, creating engaging content such as virtual campus tours, student testimonials, and interactive Q&A sessions can boost visibility and engagement, leveraging BA to drive enrollment.

5.3.2. Strengthening Brand Response via Experiential Marketing

The positive effect of BR on EEM (H3b: $\beta = 0.28$, $p = 0.002$) and its mediation role (H10: $\beta = 0.09$, $p = 0.010$), combined with EEM's top ranking in ANN (19.2%), emphasize experiential marketing's role in fostering emotional connections. HEIs should prioritize culturally relevant events, such as open days, student festivals, or cultural showcases, to evoke positive judgments and feelings (Lu & Xu, 2015). In Vietnam, incorporating community elements like alumni panels or traditional performances can enhance engagement, strengthening BR and influencing student choice.

5.3.3. Optimizing Pricing and Financial Incentives

PQ's strong influence on PFI (H2: $\beta = 0.39$, $p < 0.001$) and its mediation effect on CHO (H12: $\beta = 0.10$, $p = 0.005$) suggest that pricing strategies should align with quality perceptions. HEI managers should offer competitive tuition fees and prestigious scholarships to signal academic excellence, particularly in Vietnam's cost-sensitive market (Dao & Thorpe, 2015). However, the weak mediation of PFI for BR (H11: $\beta = 0.04$, $p = 0.098$) indicates that financial incentives alone may not evoke emotional responses. Combining PFI with other IMC practices, such as promoting scholarships during experiential events, can enhance their appeal and effectiveness.

6. Conclusion, Limitations and Future Research

This study examined how CBBE influences Vietnamese students' choice of HEIs through IMC practices, using PLS-SEM and ANN analyses. Keller's (1993) CBBE dimensions as drive institutional appeal. Brand awareness enhances digital marketing effectiveness, while perceived quality supports pricing strategies, aligning with Vietnam's cost-sensitive market (Nguyen et al., 2019). Brand response and loyalty amplify experiential and personal marketing, fostering emotional ties in Vietnam's community-oriented culture (Le et al., 2020). ANN analysis highlights experiential marketing as the top predictor, emphasizing non-linear effects. IMC practices mediate CBBE's impact, reinforcing Duncan and Moriarty's (1998) framework, with digital channels boosting visibility and quality-driven pricing enhancing value.

The study has several limitations that warrant consideration. The use of convenience sampling introduces bias and limits the generalizability of the findings, as the sample primarily comprises urban undergraduates from three geographical regions of Vietnam (North, Central, and South).

Consequently, the conclusions are most applicable to this specific population and may not fully represent Vietnam's diverse student demographics, including those from rural areas, smaller colleges, vocational institutions, or underrepresented groups such as ethnic minorities and lower socioeconomic communities (Babbie, 2016). The reliance on online recruitment via social media and university email systems likely underrepresented students with limited digital access, further constraining the sample's diversity. Also, when respondents fill out questionnaires themselves, they might answer in a way that makes them look better (Field, 2018), and changing the CBBE and IMC scales might miss important loyalty aspects that are specific to different cultures. The linearity assumptions of PLS-SEM limited the ability to detect non-linear interactions; however, this limitation was somewhat alleviated by using ANN, which is a black-box method that restricts interpretability for theory testing. The cross-sectional design also restricts causal inference due to evolving student preferences.

To overcome these issues, future studies should use probability sampling methods, like stratified or cluster sampling, to better represent the diverse higher education landscape in Vietnam. Including rural students, non-undergraduates, and underrepresented groups would provide a broader perspective on CBBE and IMC's impact. Longitudinal designs could better establish causality by tracking changes in student perceptions over time. Also, using scales that reflect specific cultures or looking into new IMC methods, like influencer marketing or mobile apps, could provide a better understanding of what Gen Z likes in Vietnam (Nguyen et al., 2019). Applying the model to other emerging HE markets in ASEAN countries, with tests for cultural and economic moderators, would further extend the framework's applicability (Pham & Lai, 2016).

Statements and Declarations

Data availability statement. The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Acknowledgements. This work was supported by Vietnam National University, Ho Chi Minh City, Vietnam (VNU-HCM) under the project grant number B2024-2803.

Disclosure statement. No potential conflict of interest was reported by the author(s).

Ethical Approval. The study adhered to the ethical principles outlined in the Declaration of Helsinki. This ensured compliance with both international ethical standards and local regulatory requirements. By obtaining institutional approval, the study met the necessary ethical and regulatory standards established by both institutions.

Informed Consent. This study did not involve any medical, psychological, or high-risk interventions. It also did not include vulnerable populations, such as minors, patients, or refugees. No financial or material incentives were provided to participants. Participation was entirely voluntary, and participants had the right to withdraw at any stage without any consequences. Additionally, participants were informed that no foreseeable risks were associated with their participation in this study.

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