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Student Co-Creation Behaviour in Vietnamese Higher Education: The Role of Perceived Value and Loyalty

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Abstract. This study examines the relationship between perceived value components, loyalty variables, and value co-creation to better understand how student loyalty develops and how they behave when creating value for higher education institutions. The investigation was conducted using a questionnaire survey from 525 students in various universities in Vietnam. The data was assessed by combining two methodologies: artificial neural networks (ANN) and partial least squares structural equation modeling (PLS-SEM). The results suggest that loyalty is significantly influenced by all dimensions of perceived value, except monetary value. In turn, this fosters a robust capacity for value co-creation. The data indicates that emotional and customization values influence student loyalty more significantly than social and monetary values. Moreover, the findings of the ANN investigation indicate that behavioral loyalty is more important for creating value than attitudinal loyalty.

Keywords: Higher education, Loyalty, Perceived value, PLS-SEM, ANN, Value co-creation.

1. INTRODUCTION

Globalization and heightened competition have led to substantial alterations in the operational mechanisms of universities and their capacity to effectively address societal challenges (Maresova, Hruska, & Kuca, 2020). Higher education institutions face new challenges regarding positioning and administration due to evolving needs. They must perpetually innovate and adjust to effectively address contemporary challenges (Maresova, Hruska, Klimova, et al., 2020). Conversely, the transformations induced by advanced education and the highly competitive landscape pose significant challenges for higher education institutions (HEIs) (Del-Castillo-Feito et al., 2019). Consequently, student retention is equally vital as student attraction and enrollment. Considering these changes, universities adopted a more student-centric approach, requiring a reassessment of their sustainable strategies to enhance student involvement in the development and execution of their university experience. To thrive amid escalating competition, higher education institutions must diligently seek innovation and investigate new strategies to differentiate themselves while maintaining their commitment to high-quality services (Paringan & Novani, 2022). As service providers, universities create value for students, leading to their satisfaction and loyalty, which is paramount. Numerous studies indicate that fostering student engagement in value-creation activities with higher education institutions can enhance universities' service quality, strengthen their brand reputation, attract additional students, and effectively mitigate student disloyalty. Furthermore, according to data from Statista and the General Statistics Office, the number of university-level students in Vietnam rose from 1,546,478 to 2,021,901, reflecting a growth rate of 30.7% (General Statistics Office, 2023). Consequently, attracting students and establishing a reputation for higher education institutions in Vietnam is a matter that requires the attention of administrators. Fostering a robust relationship between the university and its current and alumni students is an essential strategy for higher education institutions. Consequently, Vietnam is selected as the context for this study to investigate student behavior.

As Kim et al. (2019) and Koo et al. (2020) noted, perceived value is a critical determinant of loyalty and essential in fostering brand loyalty. Moreover, customers with a heightened perception of value are more inclined to achieve their purchasing goals and demonstrate loyalty to the program. This loyalty can lead to favorable attitudes and behaviors towards retail enterprises (Roy et al., 2017). Education research has investigated the relationship between perceived value and loyalty, as well as between perceived value and behavioral intentions (Zamani & Harper, 2019). Nonetheless, the preponderance of research on this specific topic is relatively limited in quantity. In higher education, the correlation between value and loyalty was weak and dependent on various elements of perceived value to evaluate its impact (Brown & Mazzarol, 2009). This study fills research gaps by investigating the impact of four perceived value factors (emotional, social, monetary, and customization value) on two dimensions of student loyalty (attitudinal and behavioral loyalty). Subsequently, while research on value co-creation is prevalent, its application in education, to the authors' knowledge, remains relatively underexplored among scholars, especially within the realm of higher education. Furthermore, previous research has predominantly concentrated on assessing the effects of loyalty, either by investigating the general notion of loyalty (Casper Ferm & Thaichon, 2021) or by explicitly scrutinizing dimensions such as behavioral loyalty (Liu & Jo, 2020) or attitudinal loyalty (Albahri et al., 2022). Prior research has focused on the impact of loyalty on value co-creation, particularly in higher education, considering both behavioral and attitudinal components of loyalty. This study aims to fill a gap in existing research by investigating the impact of value perception on student loyalty and collaborative value creation in the setting of higher education in Vietnam. In addition, the

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non-linear and non-compensatory associations of student behavioral outcomes were overlooked (Evelina et al., 2020). This study employed a PLS-SEM and artificial neural network (ANN) methodology to ascertain student loyalty and co-creation behavior determinants in higher education.

This study provides a novel perspective on value co-creation in higher education, a topic that has been largely overlooked in prior research. This study integrates the five components of perceived values to explore an approach that has not been addressed in prior research. Moreover, it broadens the research focus to encompass value co-creation, whereas previous studies concentrated exclusively on student loyalty. This study sought to augment the understanding of student behavior by delineating the theoretical connection among perceived value, loyalty, and value co-creation. Higher education institutions progressively acknowledge the significance of co-creation value in the contemporary landscape. It possesses the capacity to confer substantial competitive advantages to higher education institutions. Thus, this study offers the following contributions to enhance organizations' comprehension of students' perspectives and behaviors in the context of value co-creation: An examination of the impact of perceived value dimensions on loyalty dimensions will furnish higher education institutions with insights into the specific attributes they should emphasize to cultivate and maintain loyalty. Student loyalty denotes students' unwavering and affirmative conduct and disposition towards their university. Moreover, analyzing the influence of attitudinal and behavioral loyalty on value co-creation assists higher education institutions in pinpointing the aspects of loyalty that necessitate focus when endeavoring to engage students in enhancing educational services.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Value Co-Creation

Value co-creation, as initially articulated by Prahalad and Ramaswamy (2004), is the collaborative process by which beneficiaries and suppliers interact to produce value. Value co-creation necessitates a mutual exchange of information between consumers and suppliers, enabling providers to better comprehend client needs and preferences (Dedeoglu et al., 2018). Preikschas et al. (2017) discovered that customers can actively provide information, knowledge, and innovative ideas to enhance the value of their products or services. In this context, customers are the principal participants, while companies assume a facilitative role in enhancing products or services based on customer feedback and converting their ideas into concrete results. Conversely, prior studies have effectively utilized the value co-creation theory across diverse domains and contexts, illustrating its adaptability (Roy et al., 2017; Wahab et al., 2022). Moreover, although value co-creation has been investigated in the context of higher education, the volume and breadth of such research are still limited. Consequently, recognizing the significance of value co-creation theory in practical application, this study chose to employ value co-creation as the principal theory to examine the impact of perceived value and loyalty on students' co-creation behavior within the realm of higher education in Vietnam.

Customer participation behavior denotes the active involvement of customers in the collaborative innovation and development of products or services with the organization. Yi and Gong (2013) propose that engagement in value co-creation encompasses four principal indicators: information searching, information sharing, responsible behavior, and personal interaction. According to Yi & Gong (2013), the authors elaborated that student participation behavior in higher education encompasses the active engagement of students in generating value through knowledge sharing, opinion expression, and provision of recommendations to the university.

Customer citizenship behavior refers to voluntary actions that exceed the customer's anticipated obligations in service delivery, intended to offer assistance and support, thereby improving the overall efficacy of the business organization (Bove et al., 2009). Groth (2005) and Yi & Gong (2013) assert that citizenship behavior in value co-creation transcends mere participation. It encompasses voluntary extra-role behaviors, including feedback provision, advocacy, assistance, and tolerance. Furthermore, students' contributions to the university's success and their impact on perceptions of service quality exemplify the expression of student citizenship behavior within educational environments.

2.2. Student Loyalty

As Sahoo et al. (2019) articulated, customer loyalty denotes the emotional bond, attachment, or commitment that individuals possess towards a specific service provider. Student loyalty denotes a student's willingness to promote the university to family, friends, and others whenever opportunities arise within higher education (Mohamad et al., 2009). This study evaluates loyalty as a dual-dimensional construct, encompassing a loyal attitude and behavior. Athiyaman (1997) posits that student loyalty encompasses a student's readiness to provide favorable feedback regarding the university, endorse the course to others, and participate in alumni associations. Moreover, student loyalty is a vital metric for assessing the effectiveness of higher education institutions in retaining students until graduation and encouraging their return post-graduation.

Behavioral loyalty denotes the regularity of repeat purchases by consumers for a specific brand within a defined timeframe (Chaudhuri & Holbrook, 2001). The behavioral aspect of student loyalty is associated with students' intention to remain enrolled at their previously attended university within the higher education context (Rust & Oliver, 2012; Vianden & Barlow, 2014). Moreover, Jani & Han (2014) indicate that students may demonstrate behavioral loyalty by selecting courses, remitting tuition, or enrolling in their preferred colleges.

Attitudinal loyalty refers to the psychological bond customers form with a particular product, service, or provider (Ooi et al., 2018). Attitudinal loyalty may manifest even when a customer refrains from repeat purchases

yet advocates for the product or service to others (Mishra et al., 2017). In higher education, the attitudinal aspect of student loyalty encompasses emotional attachment, trust, and a readiness to support the university through actions such as demonstrating commitment, recommending the institution, aiding fellow students, and deciding to continue using the university's services.

2.3. Perceived Value

Zeithaml (1988) characterized perceived value as the consumers' comprehensive evaluation of the utility of a good or service. Their assessment is predicated on the value they obtain about their contributions. The perceived value comprises multiple components and possesses a multidimensional framework that may vary across distinct domains, as evidenced by the studies of Sweeney and Soutar (2001) and Al-Sabbahy et al. (2004). Furthermore, when elucidating consumer decision-making, employing multiple dimensions of perceived value produces more favorable outcomes than relying on a singular dimension such as "value for money." Conversely, the multidimensional approach seeks to elucidate this concept by considering cognitive processes and emotions (Zhang, 2021). This study categorizes student-perceived value in the educational context into four dimensions: emotional value, social value, monetary value, and customization value, to provide a comprehensive evaluation.

2.4. Hypotheses Development

2.4.1. Emotional Value

Emotional value in education refers to a product or service's ability to elicit feelings or emotional states. The study by Roig et al. (2009) suggests that emotional value influences loyalty by affecting employees' willingness to display empathy and engage in personal interactions, resulting in a positive impression on consumers. Besides, previous studies in the field of mobile telecommunications services have shown that emotional value plays a crucial role in customer satisfaction, which in turn has a favorable effect on customer loyalty (e.g. Lim et al., 2006). In higher education, the presence of emotional value can help higher education institutions create strong bonds with their students. According to Lee et al. (2007), if there is no emotional value in a relationship, it is, in fact, just a transactional and temporary relationship that the customer can leave at any time. Emotional value is an important part of cognitive value, greatly influencing university reputation and student satisfaction (Polo Peña et al., 2013). Therefore, based on previous literature, this study poses the following hypothesis:

H_{1a}. *Emotional value positively affects attitudinal loyalty.*

H_{1b}. *Emotional value positively affects behavioral loyalty.*

2.4.2. Social Value

Derived from the definition in the research by LeBlanc & Nguyen (1999), social value in educational contexts pertains to the advantages gained from establishing friendships with peers and engaging in social interactions during the course. Research examining the direct relationship between social value and loyalty is scarce; however, it often assesses the impact of perceived value on attitudinal and behavioral loyalty. Deng et al. (2010) discovered that previous research indicates each sub-dimension of perceived value distinctly affects loyalty. Perceived value often acts as a direct indicator of loyalty, significantly contributing to establishing brand loyalty (Kim et al., 2019; Koo et al., 2020). In higher education, societal values significantly impact the cultivation of student loyalty. Universities can improve students' educational experiences by providing opportunities for personal development, cultivating social connections, encouraging community involvement, and enhancing social status. Universities may prioritize various aspects of social value to attract and retain students. The present study proposes the following hypothesis:

H_{2}. *Social value positively affects attitudinal loyalty.*

2.4.3. Monetary Value

Yu & Lee (2019) define monetary value as financial and non-financial benefits such as increased income after graduation, improved knowledge and skills, personal development, career opportunities, etc., that students gain by investing financially in education. Within the mobile telecommunications service industry, multiple investigations (Deng et al., 2010; Edward & Sahadev, 2011) have discovered that perceived monetary value has a solid and beneficial effect on customer satisfaction, ultimately leading to increased loyalty. Furthermore, institutions can increase student loyalty by improving the quality of their products or services (Petruzzellis & Romanazzi, 2010). The concept of monetary value in higher education extends beyond the financial sacrifices made by students. Students are more likely to perceive higher education as a valuable endeavor worthy of investment when they recognize the possible financial advantages. Gaining a comprehensive understanding of the significance of currency will enable students to make prudent decisions about investing in higher education or remaining in their chosen educational institutions for an extended period. Thus, the subsequent hypothesis is formed:

H_{3a}. *Monetary value positively affects attitudinal loyalty.*

H_{3b}. *Monetary value positively affects behavioral loyalty.*

2.4.4. Customization Value

Customization value refers to the practice of higher education institutions engaging in dialogue with students and tailoring their educational offerings to meet the specific requirements and preferences of the students. A

previous study by Coelho and Henseler (2012) demonstrated a positive relationship between personalized value and client loyalty in the banking and cable television sectors. Moreover, consistently creating and implementing fresh transaction content can guarantee client endorsement and confidence in the enterprise's abilities, bolstering customer loyalty (Čater & Čater, 2010). Customized value in higher education refers to the unique advantages and significance that individual students gain from their educational journey. Thus, by prioritizing personalized value, higher education institutions can develop programs and services better suited to individual requirements and preferences, ultimately improving the quality of higher education and the student experience. Consequently, the following hypothesis is developed:

H_{4a}. Customization value positively affects attitudinal loyalty.

H_{4b}. Customization value positively affects behavioral loyalty.

2.4.5. Student Co-creation Behavior

In the context of higher education, the attitudinal dimension of student loyalty refers to the emotional bond, trust, and inclination to endorse the university through actions like recommending it to others, assisting fellow students, and making decisions to continue utilizing its services in the future (Vianden & Barlow, 2014). Student loyalty behavior is influenced by their choices about course enrollment, payment of tuition fees, and intention to remain at the same university they previously attended (Jani & Han, 2014). According to Poretski et al. (2019), engaging in value co-creation activities will help organizations promote and maintain consumer loyalty through online gaming platforms. Furthermore, Ranjan and Read (2016) argue that customer participation in co-creation is closely linked to happiness and is crucial in establishing brand loyalty. Additionally, customer citizenship behavior significantly builds customer loyalty and enhances business performance (Woo, 2019; Yi et al., 2011). Customer civic activity enhances customer value by creating a sense of belonging and usefulness (Assiouras et al., 2019), promoting good customer repurchase intentions through satisfaction and loyalty (Mandl & Hogreve, 2020).

Higher education views student loyalty as crucial in fostering value creation through collaboration. It facilitates the development of essential components for the success of co-creation projects, including trust, dedication, a collaborative mindset, and information sharing between students and the institution. Moreover, students who demonstrate loyalty to their colleges exhibit a keen desire to actively and collaboratively participate in higher education institutions. Even after completing their studies, they continue to generate value by promoting through word-of-mouth to potential, existing, or former students or engaging in other forms of collaboration. Thus, the current study puts forward the subsequent hypotheses:

H_{5a}. Attitudinal loyalty positively affects student participation behavior.

H_{5b}. Behavioral loyalty positively affects student participation behavior.

H_{6a}. Attitudinal loyalty positively affects student citizenship behavior.

H_{6b}. Behavioral loyalty positively affects student citizenship behavior.

Based on the above discussion, the research mode is presented in Figure 1.

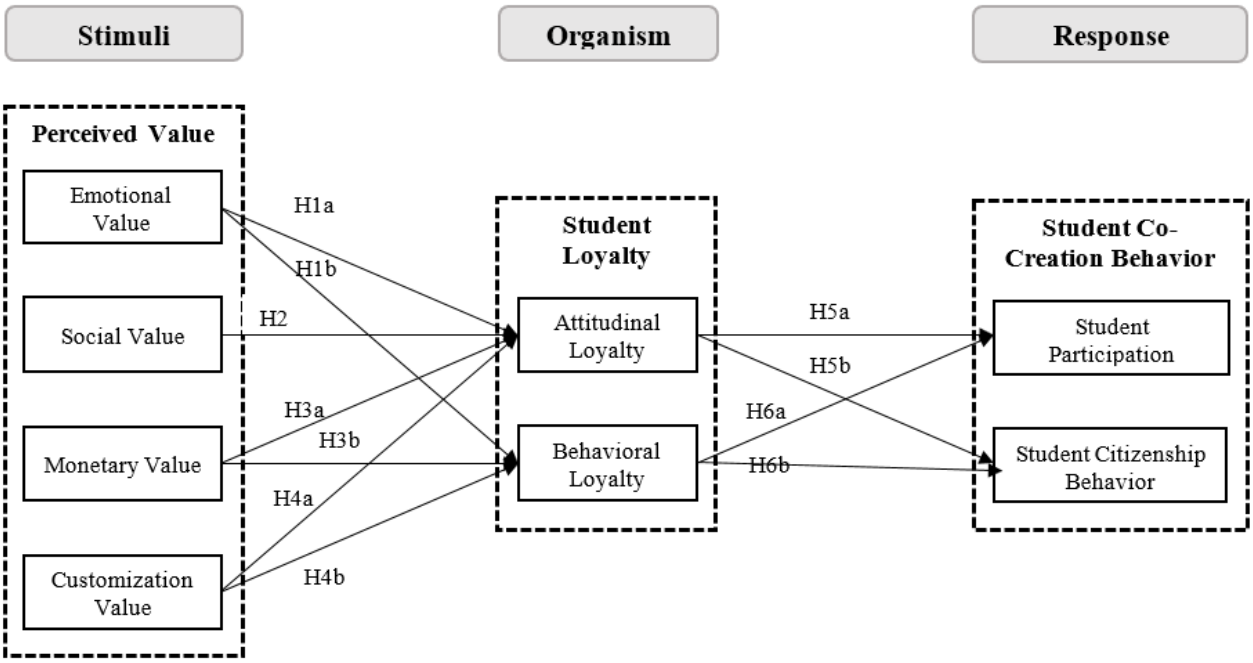

Figure 1: Research model.

3. METHODOLOGY

Due to the insufficient research on value co-creation in higher education in Vietnam and the unclear relationship between perceived value and student loyalty in this context, the authors have opted for a cause and

descriptive research methodology. This methodology assesses students' awareness and ability to co-create value with higher education institutions by analyzing their behavior (B.-T. H. Nguyen et al., 2023). This study utilizes a quantitative methodology to ensure the achievement of its objectives and the reliability and validity of its findings. The authors select the positivist paradigm as the principal research approach to investigate hypotheses derived from established theories and address the research problem (A.-H. D. Nguyen et al., 2024; L.-T. Nguyen, Phan, et al., 2023).

Furthermore, to ensure the selection of appropriate samples with analogous characteristics, the study will utilize a non-probability judgmental sampling method akin to that employed by L. T. Nguyen et al. (2022). The respondents are students currently enrolled at various universities in Ho Chi Minh City and recent graduates who have completed their studies within the last three years from these institutions. The study employed G*Power version 3 statistical software to ascertain the minimum sample size required for this research (Dang Quan et al., 2024; J. Hair et al., 2017). The analysis indicates that the minimum sample size required for optimal reliability in this study is 123 samples. Furthermore, per the guidelines established by Leong et al. (2024) for an SEM-ANN methodology, the minimum sample size in a hybrid PLS-SEM-ANN should generally be at least 50 times the highest number of arrows directed towards an endogenous construct. In this scenario, the maximum number of arrows directed towards an endogenous construct is four. Thus, the minimum sample size required is 200. This study comprises 525 samples that fulfill the criteria for further analysis following the completion of a survey and the exclusion of unsuitable samples.

To reduce neutral responses, broaden the response range, and enhance the accuracy in differentiating respondents' opinions (Bass et al., 1974), the authors chose to employ a 7-point Likert scale rather than a 5-point Likert scale. This was conducted to evaluate the behaviors and attitudes of students engaged in value-creation activities with higher education institutions. The authors corroborated prior research to amend the construct items, thereby augmenting their reliability and ensuring their appropriateness for the specific subject of investigation, namely higher education. The emotional value was specifically modified according to Aparicio-Ley et al. (2019) and Sahoo & Telang (2019). Social value was derived from the works of Dobre et al. (2021) and LeBlanc and Nguyen (1999). According to Aparicio-Ley et al. (2019) and Ledden et al. (2007), the monetary value was modified. The customization value was derived from Coelho and Henseler (2012) and Kang and Shin (2016). Attitudinal loyalty was modified according to Jiatao & Depeng (2008) and Suhartanto et al. (2013). Behavioral loyalty was derived from the works of Aparicio-Ley et al. (2019), Pinna et al. (2023), and Wahab et al. (2022). Student participation behavior and student citizenship behavior were derived from Liu & Jo (2020), Pinna et al. (2023), and Yi & Gong (2013), respectively.

4. RESULTS AND DISCUSSION

4.1. Results

4.1.1. Respondent Profile

According to the data presented in Table 1, females constituted 56.57% of the entire sample, whereas males constituted 43.43%. Additionally, the data shows that students attending private institutions provided 51.62% of the responses, while those attending public universities provided 48.38%. Regarding the education level of the respondents, the data suggest that senior students accounted for the most significant proportion (35.43%), followed by freshmen students (26.10%), junior students (15.24%), and sophomore students (11.43%) in third and fourth place, respectively. Also, 7.05% of respondents have graduated within 1 to 3 years, while 4.76% have graduated beyond three years.

Table 1: Demographic profile of respondents (N = 525).

Demographic characteristic		Frequency	Percentage
Gender	Female	228	43.43%
	Male	297	56.57%
University types	Public	254	48.38%
	Private	271	51.62%
Education level	Freshman	137	26.10%
	Sophomore	60	11.43%
	Junior	80	15.24%
	Senior	186	35.43%
	Graduated in 1 - 3 years	37	7.05%
	Graduated more than 3 years	25	4.76%

4.1.2. Common Method Bias

Since the data for both exogenous and endogenous variables is acquired from a single source, common method bias will probably arise. The authors used procedural and statistical techniques to examine the research data and a cross-sectional design to assess the potential danger of CMB and address this issue (Leong et al., 2018). Before the survey, all participants will be notified that the researcher will keep their personal information and responses anonymous and confidential. Note that none of the survey questions have right or wrong answers. Statistically, the results obtained from conducting Harman's single-factor analysis revealed that KMO and Bartlett's Test achieved 0.978, which is greater than the minimum 0.5, and the sole component achieved 46.443 percent of the total variance is lower than the threshold of 50 percent (Dang, Tran, et al., 2023; C. H. Wong et al., 2015).

4.1.3. Assessing the Measurement Model

Before testing the initial hypotheses in the structural model, it is essential to assess and validate the measurement model. The authors must evaluate the reliability and validity of the measurements to evaluate the measurement model (J. Hair et al., 2017). The reliability of this study is assessed through Cronbach's Alpha (CA), composite reliability (CR), and Dijkstra-Henseler's rho (pA) (Teo et al., 2015). As indicated in Table 2, the minimum values of CA, CR, and pA are 0.756, 0.811, and 0.777, respectively. The findings confirm CA, CR, and pA, with all constructs exhibiting a significant degree of reliability, as each value exceeds the threshold of 0.7 (Dang, Tan, et al., 2023; L.-T. Nguyen, Duc, et al., 2023). Subsequently, the convergent validity in this study was assessed using the average variance extracted (AVE) and factor loadings (FL) metrics, as outlined by Hair Jr et al. (2016). Table 2 indicates that the minimum AVE value is 0.529, surpassing the threshold of 0.5. Moreover, all factor loading values range from 0.714 to 0.854, exceeding the threshold of 0.7 (J. F. Hair, Risher, et al., 2019). Consequently, the study's convergent validity was confirmed. The discriminant validity in this study was assessed using two criteria: Fornell-Larcker's criterion (Fornell & Larcker, 1981) and cross-loadings (Henseler et al., 2015). The data presented in Table 3 indicate that all square roots of AVE surpass their respective correlation coefficients (Henseler et al., 2015). The cross-loading results in Table 4 demonstrate that all loads display strong loading for their respective structures while exhibiting weak loading for unrelated structures. This study has demonstrated the validity of the discriminant.

Table 2: Convergent Validity and Construct Reliability.

Constructs	Items	Factor Loadings (FL)	Cronbach's Alpha (CA)	Dijkstra Henseler rho_A (pA)	Composite Reliability (CR)	Average Variance Extracted (AVE)	VIF
Emotional Value (EV)	EV1	0.775	0.811	0.813	0.876	0.639	1.560
	EV2	0.822					1.766
	EV3	0.773					1.564
	EV4	0.826					1.813
Social Value (SV)	SV1	0.794	0.756	0.777	0.811	0.589	1.248
	SV2	0.790					1.376
	SV3	0.813					1.260
Monetary Value (MV)	MV1	0.846	0.885	0.886	0.916	0.685	2.354
	MV2	0.828					2.160
	MV3	0.802					1.911
	MV4	0.827					2.111
	MV5	0.834					2.152
Customization Value (CV)	CV1	0.822	0.881	0.882	0.913	0.679	2.045
	CV2	0.827					2.149
	CV3	0.809					1.918
	CV4	0.805					1.929
	CV5	0.854					2.373
Attitudinal Loyalty (AL)	AL1	0.720	0.895	0.897	0.918	0.615	1.627
	AL2	0.747					1.736
	AL3	0.812					2.150
	AL4	0.773					1.912
	AL6	0.778					1.969
	AL7	0.834					2.361
	AL8	0.818					2.247
Behavioral Loyalty (BL)	BL1	0.731	0.870	0.871	0.900	0.563	1.713
	BL2	0.763					1.819
	BL3	0.755					1.805
	BL4	0.769					1.840
	BL5	0.720					1.612
	BL6	0.764					1.795
	BL7	0.749					1.759
Student Participation Behavior (SPB)	SPB1	0.756	0.812	0.813	0.869	0.571	1.534
	SPB2	0.774					1.663
	SPB3	0.735					1.487
	SPB4	0.780					1.720
	SPB5	0.732					1.528
Student Citizenship Behavior (SCB)	SCB1	0.727	0.852	0.854	0.887	0.529	1.581
	SCB2	0.714					1.577
	SCB3	0.721					1.662
	SCB4	0.737					1.788
	SCB5	0.751					1.736
	SCB6	0.721					1.656
	SCB7	0.716					1.691

Table 3: Fonell-Lacker criterion.

Latent Construct	AL	BL	CV	EV	MV	SCB	SPB	SV
AL	0.884							
BL	0.835	0.850						
CV	0.812	0.744	0.824					
EV	0.730	0.717	0.699	0.799				
MV	0.765	0.705	0.790	0.750	0.828			
SCB	0.764	0.709	0.707	0.646	0.644	0.878		
SPB	0.767	0.755	0.732	0.648	0.673	0.824	0.796	
SV	0.663	0.674	0.645	0.609	0.583	0.652	0.668	0.767

Table 4: Cross-loadings.

Latent Construct	AL	BL	CV	EV	MV	SCB	SPB	SV
AL1	0.720	0.647	0.567	0.504	0.554	0.609	0.621	0.558
AL2	0.747	0.660	0.615	0.588	0.569	0.592	0.585	0.549
AL3	0.812	0.683	0.715	0.616	0.660	0.627	0.620	0.543
AL4	0.773	0.629	0.619	0.538	0.581	0.543	0.541	0.477
AL6	0.778	0.652	0.654	0.538	0.563	0.587	0.561	0.473
AL7	0.834	0.721	0.712	0.631	0.633	0.627	0.660	0.552
AL8	0.818	0.694	0.717	0.582	0.631	0.601	0.612	0.481
BL1	0.576	0.731	0.518	0.492	0.522	0.568	0.572	0.489
BL2	0.638	0.763	0.563	0.592	0.533	0.566	0.569	0.565
BL3	0.665	0.755	0.512	0.574	0.541	0.564	0.542	0.490
BL4	0.734	0.769	0.637	0.580	0.594	0.612	0.596	0.492
BL5	0.590	0.720	0.547	0.465	0.491	0.625	0.649	0.441
BL6	0.655	0.764	0.592	0.559	0.534	0.631	0.647	0.551
BL7	0.626	0.749	0.528	0.504	0.488	0.674	0.588	0.508
CV1	0.697	0.620	0.822	0.632	0.679	0.608	0.613	0.585
CV2	0.669	0.589	0.827	0.563	0.664	0.557	0.593	0.507
CV3	0.705	0.626	0.809	0.581	0.678	0.573	0.607	0.544
CV4	0.671	0.589	0.805	0.512	0.584	0.555	0.546	0.497
CV5	0.717	0.638	0.854	0.588	0.649	0.616	0.653	0.520
EV2	0.567	0.555	0.530	0.775	0.563	0.515	0.498	0.430
EV3	0.608	0.609	0.588	0.822	0.622	0.542	0.558	0.498
EV4	0.557	0.546	0.527	0.773	0.613	0.502	0.494	0.484
EV5	0.601	0.582	0.588	0.826	0.600	0.506	0.518	0.532
MV1	0.627	0.571	0.660	0.596	0.846	0.489	0.516	0.448
MV2	0.600	0.555	0.620	0.585	0.828	0.519	0.544	0.467
MV3	0.614	0.580	0.640	0.617	0.802	0.553	0.562	0.513
MV4	0.649	0.592	0.680	0.630	0.827	0.539	0.569	0.489
MV5	0.671	0.616	0.668	0.668	0.834	0.562	0.590	0.493
SCB1	0.660	0.676	0.577	0.558	0.537	0.727	0.584	0.522
SCB2	0.611	0.664	0.553	0.569	0.522	0.714	0.593	0.540
SCB3	0.534	0.528	0.498	0.420	0.455	0.721	0.598	0.463
SCB4	0.504	0.541	0.511	0.438	0.465	0.737	0.611	0.455
SCB5	0.531	0.574	0.479	0.441	0.424	0.751	0.604	0.445
SCB7	0.528	0.556	0.522	0.447	0.427	0.721	0.616	0.461
SCB8	0.477	0.535	0.431	0.368	0.417	0.716	0.586	0.402
SPB1	0.625	0.627	0.603	0.548	0.559	0.588	0.756	0.524
SPB2	0.600	0.608	0.581	0.500	0.538	0.633	0.774	0.510
SPB3	0.579	0.627	0.530	0.486	0.504	0.637	0.735	0.533
SPB4	0.556	0.579	0.525	0.465	0.477	0.613	0.780	0.440
SPB10	0.530	0.554	0.519	0.440	0.455	0.643	0.732	0.512
SV1	0.410	0.429	0.414	0.466	0.414	0.418	0.414	0.694
SV5	0.484	0.509	0.437	0.433	0.380	0.504	0.516	0.790
SV6	0.605	0.592	0.605	0.504	0.532	0.562	0.586	0.813

4.1.4. Assessing the Structural Model

Initially, before validating the proposed hypotheses, the authors tackled the multicollinearity problem by conducting a collinearity assessment (J. F. Hair, Risher, et al., 2019). The VIF results for all structures in Table 2 range from 1.248 to 2.373, remaining below the threshold value of 3 (Tan & Ooi, 2018). Therefore, the potential for multicollinearity in the current study cannot be disregarded. Inferential statistics were derived using a bootstrapping method with 5,000 subsamples, no sign change, and 99 percent bias-corrected confidence intervals. The results of the hypothesis testing presented in Table 5 demonstrate that EV and CV significantly affect the variables AL and BL, as evidenced by a p-value < 0.05. Thus, hypotheses H1a-b and H4a-b are validated. Moreover, the results demonstrate that SV significantly influences AL. Moreover, AL and BL substantially impact SPB and SCB, as indicated by their p-values < 0.001. Thus, the associations among hypotheses H2, H5a-b, and H6a-b are corroborated. The p-value of 0.054 exceeds the threshold of 0.05, suggesting that the relationship between MV and BL lacks statistical significance. Consequently, H3b lacks substantial support. The results demonstrated a significant correlation between MV and AL, validating hypothesis H3a. Consequently, according to the results presented in Table 4.7, the author concludes that apart from the correlation between MV and BL, all other variables demonstrate a significant correlation.

Table 1: Hypotheses testing.

Hypotheses	Paths	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values (ρ)	Remark
H1a	EV → AL	0.178	0.175	0.056	3.149	0.002	Supported
H1b	EV → BL	0.333	0.330	0.063	5.293	0.000	Supported
H2	SV → AL	0.141	0.141	0.037	3.815	0.000	Supported
H3a	MV → AL	0.149	0.152	0.058	2.583	0.010	Supported
H3b	MV → BL^{NS}	0.138	0.142	0.072	1.930	0.054	Unsupported
H4a	CV → AL	0.508	0.508	0.058	8.687	0.000	Supported
H4b	CV → BL	0.402	0.402	0.078	5.139	0.000	Supported
H5a	AL → SPB	0.325	0.326	0.076	4.302	0.000	Supported
H5b	AL → SCB	0.267	0.267	0.070	3.805	0.000	Supported
H6a	BL → SPB	0.517	0.517	0.078	6.640	0.000	Supported
H6b	BL → SCB	0.580	0.581	0.068	8.524	0.000	Supported

Note: NS = Not Supported; EV = Emotional Value; SV = Social Value; MV = Monetary Value; CV = Customization Value; AL = Attitudinal Loyalty; BL = Behavioral Loyalty; SPB = Student Participation Behavior; SCB = Student Citizenship Behavior.

4.1.5. The Predictive Relevance and Effect Size

To determine the effect size for each of the external factors, the study computed Cohen (f^2) values. The effect sizes precisely quantify the impact of each external factor on the internal factor's R^2 value (Cohen, 1988). Accordingly, Cohen's f^2 values will indicate small, medium, and large effects when they exceed the threshold values of 0.02, 0.15, and 0.35, respectively (Kraft, 2020). The findings from Table 6 show that MV does not significantly impact BL, as evidenced by its f^2 value of 0.016, which is below the threshold of 0.02. Conversely, effect levels between 0.028 and 0.343 suggest that the other external factors have a small to moderate impact on the internal factor.

Table 2: Effect Size (f^2).

Predictor Construct/ Dependent Construct	AL	BL	SPB	SCB
AL			0.083	0.059
BL			0.211	0.277
CV	0.343	0.155		
EV	0.051	0.124		
MV	0.028	0.016		
SV	0.045			

4.1.6. Artificial Neural Network (ANN) Analysis

The analysis using Artificial Neural Network (ANN) may evaluate linear and nonlinear interaction between structures, resulting in more precise predictions. On the other hand, the analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM) only considers the linear relationship between structures. Thus, this study employed PLS-SEM and ANN analytic methodologies, like K. B. Ooi et al., (2018) research, to enhance the persuasiveness of arguments and accuracy of forecasts concerning student behavior during value co-creation with higher educational institutions. Accordingly, Figures 2 to 5 illustrate the ANN models for four different models: A, B, C, and D, respectively, with the number of hidden neurons generated in ANN Model A and C being three and in ANN models B and D being 2. This study employed a ten-fold cross-validation technique on the dataset to reduce the risk of model overfitting. This study employed a methodology involving ten artificial neural networks (ANNs) and a data partitioning ratio of 90:10 (T. C. Wong et al., 2018). The Root Mean Squared Error (RMSE) values for all ANN Models A, B, C, and D, as presented in Table 7, are comparatively low, with mean values between 0.658 and 0.800. This outcome demonstrates that all four ANN models exhibit a substantial degree of fit (Zhu et al., 2022). The RMSE values used to compute the R2 values in ANN Models A, B, C, and D demonstrate 99.43% accuracy in predicting AL, 99.46% accuracy in predicting BL, 99.41% accuracy in predicting SPB, and 99.35% accuracy in predicting SCB.

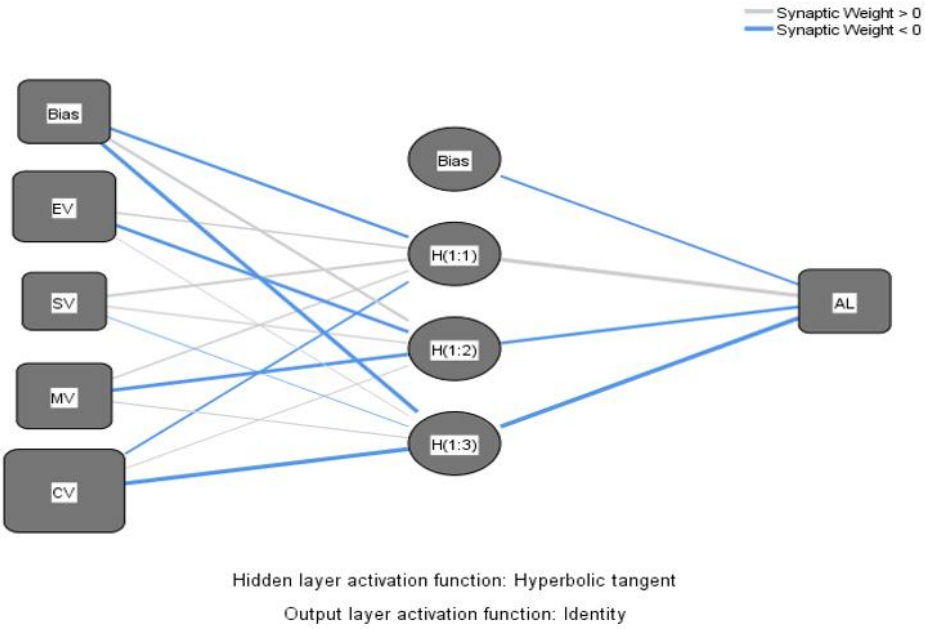

Figure 2: ANN model A.

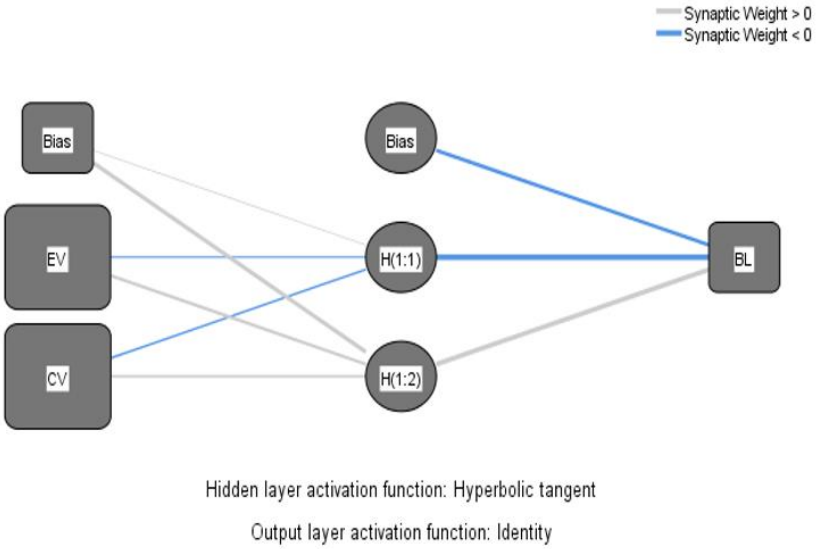

Figure 1: ANN Model B.

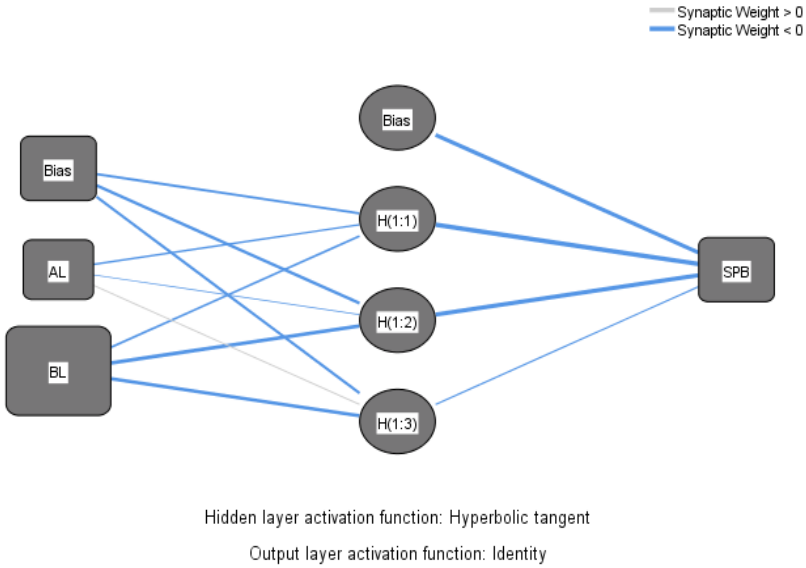

Figure 4: ANN Model C.

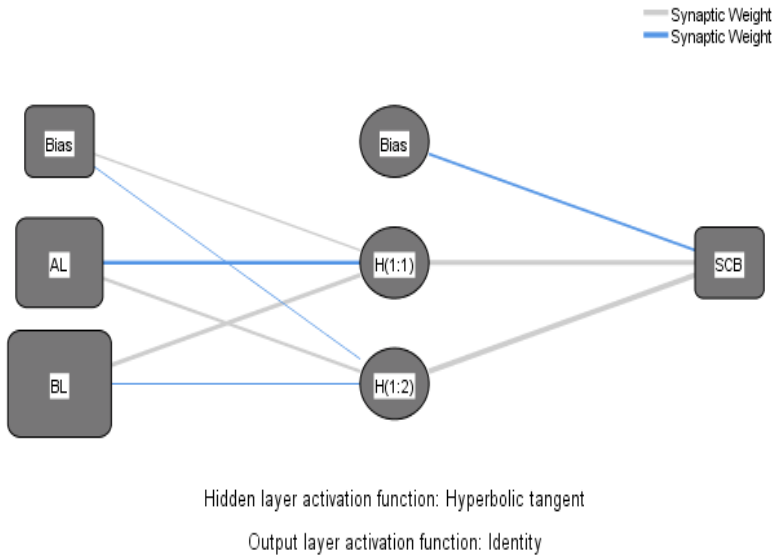

Figure 5: ANN Model D.

Table 7: RMSE Values for AL, BL, SPB, SCB.

	Model A Input: EV, SV, MV, CV Output: AL		Model B Input: EV, CV Output: BL		Model C Input: AL, BL Output: SPB		Model D Input: AL, BL Output: SCB	
Neutral network	**Training RMSE**	**Testing RMSE**	**Training RMSE**	**Testing RMSE**	**Training RMSE**	**Testing RMSE**	**Training RMSE**	**Testing RMSE**
ANN1	0.756	0.745	0.813	0.852	0.693	0.742	0.807	0.717
ANN2	0.849	0.889	0.807	0.811	0.691	0.596	0.805	0.667
ANN3	0.799	0.788	0.792	0.746	0.720	0.667	0.806	0.756
ANN4	0.772	0.783	0.779	0.766	0.784	0.659	0.782	0.710
ANN5	0.820	0.808	0.764	0.860	0.717	0.596	0.816	0.641
ANN6	0.792	0.754	0.779	0.759	0.733	0.678	0.812	0.750
ANN7	0.813	0.873	0.788	0.759	0.721	0.622	0.816	0.725
ANN8	0.784	0.808	0.783	0.800	0.690	0.733	0.800	0.680
ANN9	0.783	0.745	0.805	0.831	0.712	0.585	0.786	0.792
ANN10	0.799	0.692	0.771	0.642	0.676	0.698	0.773	0.714
Mean	0.797	0.789	0.788	0.783	0.714	0.658	0.800	0.715
SD	0.026	0.060	0.016	0.064	0.030	0.057	0.015	0.045

Furthermore, the importance of each predictor in the neural network was evaluated through sensitivity analysis (Leong et al., 2024). The normalized importance (%) values obtained are displayed in Table 8. The findings indicate that CV is the primary predictor for ANN Model A, with a normalized importance of 100%, succeeded by EV at 69%, MV at 55.50%, and SV at 35.80%. An analogous explanation applies to ANN Model B, wherein validation significantly impacts CV (with a normalized relative importance of 100%), while EV exerts the second most significant influence on BL, ranking at 99.30%. The findings for ANN Model C reveal that the BL was the most significant predictor, exhibiting a normalized value of 100%, while the AL factor demonstrated a normalized importance of 40.60%. Consistent with the results of ANN Model C, the principal prediction of ANN Model D is BL (100%), followed by AL (75.70%). The outcomes of the comparative analysis of ranking discrepancies between PLS-SEM and ANN are presented in Table 9. The findings indicate that all four models align with the PLS-SEM results.

Table 8: Sensitivity Analysis.

Neutral network	Model A (Output: AL) EV	SV	MV	CV	Model B (Output: BL) EV	CV	Model C (Output: SPB) AL	BL	Model D (Output: SCB) AL	BL
ANN1	0.181	0.227	0.187	0.405	0.465	0.535	0.429	0.571	0.408	0.592
ANN2	0.250	0.201	0.186	0.362	0.355	0.645	0.284	0.396	0.467	0.533
ANN3	0.181	0.170	0.279	0.370	0.521	0.479	0.388	0.612	0.363	0.637
ANN4	0.172	0.209	0.278	0.340	0.473	0.527	0.485	0.515	0.349	0.651
ANN5	0.234	0.257	0.190	0.319	0.480	0.520	0.354	0.646	0.235	0.765
ANN6	0.249	0.221	0.199	0.331	0.474	0.526	0.347	0.653	0.455	0.545
ANN7	0.150	0.238	0.286	0.325	0.499	0.501	0.377	0.623	0.364	0.636
ANN8	0.128	0.219	0.225	0.428	0.454	0.546	0.311	0.689	0.418	0.582
ANN9	0.166	0.200	0.230	0.404	0.380	0.620	0.346	0.654	0.431	0.569
ANN10	0.184	0.198	0.197	0.420	0.537	0.463	0.267	0.733	0.400	0.600
Average relative importance	0.190	0.214	0.226	0.370	0.464	0.536	0.359	0.609	0.389	0.611
Normalized relative importance (%)	69.000	35.800	55.500	100.000	99.300	100.000	40.600	100.000	75.700	100.000

Table 9: Comparison between PLS-SEM and ANN results.

PLS Path	Original Sample (O)/ Path Coefficient	ANN Results: Normalized Relative Importance (%)	Ranking (PLS-SEM) [Based on Path Coefficient]	Ranking (ANN) [Based on Normalized Relative Importance]	Remark
Model A (Output: AL)					
EV → AL	0.178	69.000	2	2	Match
SV → AL	0.141	35.800	4	4	Match
MV → AL	0.149	55.500	3	3	Match
CV→ AL	0.508	100.000	1	1	Match
Model B (Output: BL)					
EV → BL	0.333	99.300	2	2	Match
CV → BL	0.402	100.000	1	1	Match
Model C (Output: SPB)					
AL → SPB	0.325	40.600	2	2	Match
BL → SPB	0.517	100.000	1	1	Match
Model D (Output: SCB)					
AL → SCB	0.267	75.700	2	2	Match
BL → SCB	0.580	100.000	1	1	Match

4.2. Discussion

This research employed the theories of value co-creation, perceived value, and loyalty as the overarching theoretical framework. Consequently, it has revealed new insights into the development of value co-creation between students and higher education institutions. It provides a comprehensive perspective on student behavior regarding educational services and higher education institutions, influenced by perceived value and loyalty. The study's findings suggest that a favorable perception of emotional and customized value will foster student loyalty, both behaviorally and attitudinally. Simultaneously, social value and monetary value exclusively exert a beneficial influence on loyalty attitudes. These two dimensions of loyalty will assist higher educational institutions in enhancing students' willingness to collaborate and generate value. In summary, all hypotheses posited in this study are corroborated by the experimental results, except the monetary value. This research paper's findings have simultaneously advanced the exploration of a previously underrepresented area in higher education literature.

4.2.1. Theoretical Implications

This study contributes to the increasing number of studies on value co-creation in higher education by examining the influence of perceived value on student loyalty. Additionally, it explores the potential for value co-creation between students and higher education institutions. First, prior research on value co-creation has primarily examined its influence on loyalty, neglecting to investigate the reciprocal impact of loyalty on value co-creation (Cossío-Silva et al., 2016; Opata et al., 2021). Besides, the impact of factors influencing student loyalty on stimulating their collaboration with HEIs to create value remains mostly ambiguous. Thus, the authors posit a theoretical connection between the capacity to collaboratively generate value through perceived value and loyalty, thereby enhancing comprehension of students' roles and conduct in engaging in the co-creation process.

Secondly, the group of authors conducted a more detailed analysis of the internal components of loyalty and categorized loyalty into two main aspects, behavioral and attitudinal, to provide a clearer understanding of how these factors influence the co-creation of value behaviors between students and HEIs. The study's results reveal that CV, EV, MV, and SV determine both behavioral and attitudinal aspects of loyalty, significantly influencing value co-creation in higher education. Furthermore, the authors found that value co-creation in the context of higher education can also be determined by behavioral loyalty and attitudinal loyalty.

Finally, this study enhances the existing literature by providing a more multidimensional perspective for analyzing the impact of EV, SV, MV, and CV on AL and BL. As a result, this study contributed to the current literature on perceived value in higher education by revealing a new finding that monetary value does not impact behavioral loyalty but positively influences students' attitudinal loyalty towards higher education institutions.

The remaining components (EV, SV, CV) significantly impact the development of student loyalty.

4.2.2. Managerial Implications

This study offers the following contributions to help students and higher education institutions gain a deeper understanding of the value co-creation process: First, this study offered a theoretical framework for educational organization managers to get a comprehensive understanding and devise more effective techniques for collaborative strategy development with students. Specifically, the results of the present study will aid administrators in creating robust strategies to ensure the loyalty and retention of their pupils. Simultaneously, this aids universities in cultivating and preserving robust connections with students, thereby augmenting student contentment and the resilience of their partnerships. Furthermore, this study enhances students' ability to effectively engage with their universities and faculties by actively participating in activities that add value.

Second, the findings of this study suggest that universities must establish effective communication channels with their students to promote their active involvement and participation in activities that contribute to the development of values. By engaging in discourse, universities can determine whether their educational offerings align with student expectations. Information exchange plays a crucial role in enabling institutions to precisely understand students' needs, making it an indispensable component of co-creation services. From this standpoint, universities can foster student engagement in improvement processes by utilizing social media platforms or blogs. This may include involvement in curriculum and course design and participation in social projects that address community needs, services, and activities.

Finally, managers should prioritize assessing the perceived customization and emotional value that students experience during their university studies, as research has demonstrated that these factors significantly influence students' loyalty to the university. Understanding the value of personalization and positive emotional experiences plays a crucial role in motivating students to remain loyal to the university and prevents them from considering offers from competing institutions. This is because devoted students will actively disseminate information, knowledge, and experiences about the university. They will also encourage their relatives and friends to pursue education at the same institution, and they may even choose to pursue advanced degrees at their alma mater. This fosters and guarantees a robust emotional bond among students, universities, and academics.

5. CONCLUSION

The application of a cross-sectional methodology in this study is inadequate for a comprehensive analysis of the causal relationships proposed in the hypothesized model. This has constrained the ability to elucidate alterations in student behavior across various time frames. Therefore, it is prudent to undertake future research on student behavior employing a longitudinal methodology. The research can yield significant insights for formulating effective management practices using a longitudinal methodology. This study exclusively collects data from students enrolled in 14 universities in a Vietnamese city. The narrow focus may hinder the extrapolation of findings to all diverse universities. Consequently, an additional promising avenue of study involves conducting research in diverse geographical regions or engaging in cross-cultural investigations to collect varied data and corroborate findings from other cultures, considering the scarcity of existing research on this specific topic. Moreover, the choice of scientific publications on value co-creation as the theoretical foundation for this study is constrained by limitations. The authors advocate for future research investigating customer value co-creation behavior within a more holistic framework incorporating interrelated theoretical constructs. Recent research models can integrate various supplementary factors, including the social responsibility, reputation, and trustworthiness of higher education institutions (HEIs). Moreover, replicating this study framework in additional service industries would be advantageous in assessing the model's applicability across diverse service categories. The outcomes obtained in this manner can be extended to a broader range of service industries.

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