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## Development and Validation of a Cost-Benefit and Satisfaction-Based Instrument for Measuring Higher Education Service Quality

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**Abstract.** In the context of increasing financial autonomy and growing expectations regarding accountability and return on investment, higher education institutions are increasingly required to demonstrate not only academic quality but also value for money. However, existing higher education service quality models primarily focus on service performance and satisfaction while paying limited attention to students' cost-benefit evaluations. This study aimed to develop and validate a multidimensional instrument for measuring higher education service quality from a cost-benefit and student satisfaction perspective. A sequential mixed-methods design was employed. The qualitative phase involved literature synthesis, semi-structured interviews, and focus group discussions with 45 students to identify key dimensions of perceived benefits, perceived sacrifices, and satisfaction. The quantitative phase surveyed 703 students from multiple higher education institutions and employed reliability analysis, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) for psychometric validation. The final instrument consisted of 50 items across six dimensions: Academic Value, Learning Facilities and Resources, Student Support Services, Developmental and Career Benefits, Institutional Responsiveness and Digital Experience, and Perceived Cost and Academic Strain. The model demonstrated strong reliability and acceptable model fit (Cronbach's alpha = 0.893–0.966; CFI = 0.906; TLI = 0.901; RMSEA = 0.066). The study contributes theoretically by extending higher education service quality measurement through an integrated cost-benefit and satisfaction framework and practically by proposing a standardized Composite

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Service Quality Score (CSQS) to support benchmarking, quality assurance, and evidence-based institutional governance.

**Keywords:** higher education service quality; cost-benefit analysis; student satisfaction; instrument development; perceived value.

## 1. Introduction

Over the past decades, higher education has increasingly evolved from purely public good to a service-oriented sector characterized by competition, accountability, and stakeholder responsiveness. Universities are no longer evaluated solely by academic prestige but also by their ability to deliver value, ensure transparency, and demonstrate return on investment (ROI) for students and society. This transformation reflects broader trends in global higher education, including marketization, institutional autonomy, and performance-based governance (Abbas & Sagsan, 2019; Teeroovengadum et al., 2016). In this context, students are increasingly positioned as primary stakeholders whose perceptions of quality, value for money, and satisfaction influence institutional reputation and sustainability.

Service quality in higher education has been extensively conceptualized through models such as SERVQUAL (Parasuraman et al., 1988), HEDPERF (Abdullah, 2006), HESQUAL (Teeroovengadum et al., 2016), and HEISQUAL (Abbas, 2020). These models emphasize dimensions such as academic quality, administrative services, facilities, and institutional image. While they have significantly contributed to understanding student satisfaction, they most focus on perceived service performance and expectation gaps. Relatively limited attention has been paid to integrating cost-benefit considerations into higher education service quality measurement frameworks. Existing models rarely examine how students balance financial and opportunity costs against long-term benefits such as employability and skill development.

The cost-benefit perspective has been widely applied in economics and technology adoption studies to explain perceived value and behavioral intentions (Lu et al., 2011; Yang et al., 2016). In higher education, rising tuition fees and increasing financial autonomy have intensified public scrutiny regarding the economic and social returns of university education (Jongbloed, 2005). Students and families increasingly assess whether tuition, living expenses, and opportunity costs are justified by academic quality, career prospects, and personal development outcomes. However, empirical research systematically operationalizing cost-benefit constructs within higher education service quality instruments remains scarce.

In Vietnam, higher education has undergone significant reforms, including expansion, diversification, and strengthened quality assurance mechanisms. Policies promoting institutional autonomy have shifted greater financial responsibility to universities and students, thereby heightening expectations regarding accountability and service performance. In this evolving landscape,

institutions require rigorous and contextually grounded measurement tools to evaluate service quality from both experiential and economic perspectives.

Existing Vietnamese studies have primarily examined student satisfaction or service quality using adapted versions of international models, often without incorporating opportunity costs, perceived ROI, or standardized benchmarking indices. The absence of an integrated, multidimensional instrument that simultaneously captures academic value, service experience, financial costs, opportunity costs, and long-term benefits constitutes a significant research gap. Moreover, limited research has developed composite quality indices that translate multidimensional service indicators into standardized, decision-support metrics.

Addressing these gaps, the present study aims to develop and validate a cost-benefit and satisfaction-based instrument for assessing higher education service quality. Specifically, the study pursues three objectives: (1) to construct a theoretically grounded framework integrating cost dimensions (financial, opportunity, and intangible costs) with perceived benefits and satisfaction factors; (2) to empirically test the reliability and construct validity of the proposed instrument through sequential mixed-methods procedures, including expert consultation, exploratory factor analysis, and confirmatory factor analysis; and (3) to propose a standardized Composite Service Quality Score to support institutional benchmarking and quality governance. By extending service quality measurements through the lens of cost-benefit analysis and student satisfaction, this research contributes to both theory and practice in higher education quality assurance.

## **2. Literature Review**

### **2.1. Core Concepts**

#### *2.1.1. Quality in Higher Education*

The concept of quality is multidimensional and context dependent. Classical perspectives define quality as conformance to requirements (Crosby, 1979), fitness for purpose (Juran, 1992), or value for money (Harvey & Green, 1993). Garvin (1987) further identified several perspectives on quality, including user-based, production-based, and value-based approaches, highlighting that quality perceptions depend on stakeholder expectations.

In higher education (HE), the concept of quality becomes more complex due to the intangible and co-produced nature of learning processes and the long-term impact of educational outcomes. Cheng and Tam (1997) described educational quality as the alignment of inputs, processes, and outputs that satisfy both internal and external stakeholders. Harvey and Green (1993) similarly proposed that quality in HE may be interpreted as excellence, consistency, fitness for purpose, value for money, or transformation. With the global transition from elite, state-funded systems to massified and partially market-driven higher education, accountability and performance measurement have become increasingly important (Jongbloed, 2005). Universities are therefore expected not only to maintain academic rigor but also to demonstrate the value and relevance of the education they provide.

### 2.1.2. *Service Quality in Higher Education*

The conceptualization of higher education as a service has gained increasing attention since the late twentieth century. Cuthbert (1996) noted that higher education shares key characteristics of services, including intangibility, heterogeneity, and the simultaneous production and consumption of educational experiences. From this perspective, students' experiences encompass teaching quality, administrative services, learning facilities, and institutional support (Abdullah, 2006).

Service quality research originates from marketing theory. Parasuraman et al. (1988) defined service quality as the gap between customer expectations and perceived performance and developed the SERVQUAL model based on five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. However, SERVQUAL has been criticized when applied to higher education because it does not sufficiently capture academic and outcome-related aspects (Abdullah, 2006). To address these limitations, higher education-specific models such as HEdPERF (Abdullah, 2006), HESQUAL (Teeroovengadum et al., 2016), and HEISQUAL (Abbas, 2020) were developed. While these frameworks demonstrate strong psychometric validity and confirm the role of service quality in shaping student satisfaction, they primarily focus on experiential dimensions and rarely incorporate economic sacrifice or opportunity cost in evaluating higher education services.

Recent higher education research increasingly emphasizes that students evaluate service quality not only through instructional experiences but also through perceived value, fairness, and long-term developmental outcomes (Amado et al., 2023; Iskandar et al., 2024). Within this perspective, academic value refers to students' perceived educational return derived from teaching effectiveness, curriculum relevance, assessment fairness, and alignment between university learning experiences and future professional expectations. Student support services encompass institutional administrative, academic, financial, and advisory mechanisms that facilitate students' educational experiences and reduce procedural barriers throughout their learning journey (Supriyanto et al., 2025).

In addition, intangible costs represent non-monetary sacrifices associated with higher education participation, including opportunity costs, psychological burden, workload intensity, time investment, and reduced work-life balance. These dimensions collectively reflect the broader notion of perceived sacrifice within higher education value evaluation frameworks (Camilleri, 2024; Iskandar et al., 2024)

### 2.1.3. *Student Satisfaction*

Student satisfaction is generally conceptualized as a post-consumption evaluative judgment formed through comparison between expectations and actual experiences (Cronin & Taylor, 1992; O'Neill & Palmer, 2004). Student satisfaction has been associated with institutional image, perceived quality, expectations, loyalty, and positive word-of-mouth behavior. (Alves & Raposo, 2007).

In HE contexts, satisfaction extends beyond immediate academic experiences to include perceptions of institutional fairness, tuition transparency, support

services, and employability prospects. As tuition fees rise, satisfaction increasingly reflects perceived fairness between costs incurred and benefits received (Jongbloed, 2005).

#### *2.1.4. Quality from a Cost–Benefit Perspective*

Cost–Benefit Analysis (CBA) is a foundational framework in welfare economics used to evaluate investments by comparing aggregated costs and benefits over time (Anthony E. Boardman et al., 2018). In education economics, CBA assesses private and social returns to schooling (Psacharopoulos & Patrinos, 2010). Beyond macro-level analyses, perceived cost–benefit evaluation influences individual decision-making in service consumption and technology adoption (Lu et al., 2011; Yang et al., 2016). In HE, costs encompass not only tuition fees but also living expenses, tangible costs, opportunity costs (foregone income), psychological burden, and time investment. Benefits include enhanced employability, income prospects, skill development, social capital, and reputational advantages. Despite the centrality of ROI discourse in policy debates, measurement instruments rarely operationalize cost constructs within service quality frameworks.

## **2.2. Foundational Theories and Models**

Research on higher education service quality has progressively evolved from generic service-quality theories toward context-specific and multidimensional frameworks. Early models primarily emphasized expectation–performance gaps and functional service delivery, whereas more recent approaches have incorporated institutional image, employability outcomes, digital learning environments, and perceived value dimensions (Abdullah, 2006; Teeroovengadum et al., 2016; Abbas, 2020). Recent empirical studies further demonstrate that students’ evaluations of higher education quality are increasingly influenced by perceived value, satisfaction, loyalty, and institutional reputation (Amado et al., 2023; Bui et al., 2022; Supriyanto et al., 2025). Nevertheless, despite these theoretical advancements, most existing frameworks continue to conceptualize higher education quality predominantly from a service-performance perspective, with limited attention to students’ multidimensional cost–benefit evaluations and perceived sacrifices associated with higher education participation.

#### *2.2.1. Cost–Benefit Analysis*

CBA originates from welfare economics and is commonly used to judge whether the benefits of an intervention justify its costs (Anthony E. Boardman et al., 2018). In education research, CBA has been applied to estimate private and social returns to educational investment, often operationalized through economic gains such as earnings and productivity (Psacharopoulos & Patrinos, 2010). In addition to macro-level evaluations, CBA provides a useful lens for understanding learners’ value judgments, where individuals compare sacrifices with expected gains when appraising educational quality.

Applied to higher education quality evaluation, the CBA lens can be decomposed into costs and benefits. The cost component comprises material costs (e.g., tuition and fees, living expenses, learning materials/equipment, and other direct

educational expenditures) and intangible costs (e.g., opportunity costs such as foregone income, time investment, academic workload, and psychological effort).

The benefit component is conceptualized as perceived value and social influence. Perceived value reflects learners' appraisal of whether academic quality, curriculum relevance, skill acquisition, institutional reputation, and developmental outcomes are commensurate with the sacrifices incurred. Social influence captures the extent to which significant others and external stakeholders (e.g., employers, peers, family, and society) recognize and reinforce the value of the educational credential. From this perspective, higher education quality is evaluated through the perceived balance between multi-dimensional costs and benefits rather than through performance perceptions alone.

### 2.2.2. *SERVQUAL*

*SERVQUAL* conceptualizes service quality as the gap between expectations and perceived performance (Parasuraman et al., 1988). It proposes five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. Although originally developed for generic service contexts, *SERVQUAL* provided foundational dimensions that have been adapted to higher education settings, particularly for capturing facility quality and service interaction attributes.

### 2.2.3. *HEDPERF*

*HEDPERF* was developed as a higher education-specific service quality framework (Abdullah, 2006). It extends beyond *SERVQUAL* by explicitly incorporating education-relevant dimensions, including academic aspects, non-academic aspects, reputation, access, and program issues. *HEDPERF* therefore offers a more context-sensitive structure for capturing both teaching-related experiences and institutional attributes shaping student evaluations.

### 2.2.4. *HESQUAL and HEISQUAL*

*HESQUAL* advances higher education service quality measurement by proposing a hierarchical conceptualization that integrates teaching, support services, facilities, and administrative dimensions (Teeroovengadum et al., 2016). *HEISQUAL* further refines measurement by incorporating contemporary institutional factors, typically including teaching quality, support services, infrastructure, and institutional image, alongside governance-related considerations (Abbas, 2020).

Although these models significantly improved the contextual relevance of higher education service quality measurement, they still primarily emphasize institutional performance, learning experiences, and administrative effectiveness. Relatively limited attention has been paid to integrating economic sacrifice, opportunity cost, academic strain, and perceived return on investment into service quality evaluation frameworks. This limitation becomes increasingly important as higher education systems worldwide experience rising tuition fees, digital transformation, marketization, and growing accountability pressures (Camilleri, 2024; Iskandar et al., 2024). Recent studies similarly highlight that students increasingly evaluate universities based not only on teaching quality but also on employability prospects, institutional responsiveness, perceived fairness,

and long-term developmental outcomes (Hai, 2021; Bui et al., 2022; Supriyanto et al., 2025). Consequently, a more integrated framework that simultaneously captures perceived benefits, perceived sacrifices, and student satisfaction is needed to reflect the contemporary higher education environment.

#### *2.2.5. Limitations of Existing Higher Education Service Quality Models*

Despite substantial advancements in higher education service quality research, several conceptual and methodological limitations remain evident across existing frameworks. SERVQUAL, although foundational, was originally developed for commercial service settings and has been criticized for insufficiently capturing the academic, developmental, and outcome-oriented characteristics of higher education (Abdullah, 2006; Alemu, 2023). Its expectation–performance gap logic has also been questioned because students' expectations are highly dynamic and context dependent.

Higher education-specific models such as HEdPERF, HESQUAL, and HEISQUAL addressed several contextual limitations by incorporating academic quality, institutional image, facilities, administrative support, and employability-related dimensions (Abdullah, 2006; Teeroovengadum et al., 2016; Abbas, 2020). Nevertheless, these frameworks continue to focus predominantly on perceived service performance and institutional delivery mechanisms. Students are generally conceptualized as service recipients evaluating educational experiences rather than as stakeholders conducting broader cost–benefit appraisals of educational investment.

Existing models also rarely operationalize multidimensional sacrifice-related constructs such as opportunity cost, psychological burden, workload intensity, time investment, and perceived return on investment. However, recent studies indicate that students increasingly evaluate higher education through value-for-money considerations, balancing financial and non-financial sacrifices against expected academic, career, and developmental outcomes (Amado et al., 2023; Iskandar et al., 2024). This trend has become particularly significant in contexts characterized by increasing tuition fees, digital learning expansion, and heightened employability expectations (Camilleri, 2024).

Furthermore, contemporary higher education research increasingly emphasizes the interconnected roles of service quality, perceived value, satisfaction, loyalty, institutional reputation, and employability outcomes (Bui et al., 2022; Supriyanto et al., 2025). Nevertheless, these dimensions are often examined separately rather than integrated into a unified multidimensional framework combining perceived benefits, perceived sacrifices, and satisfaction evaluation. Therefore, a significant research gap remains regarding the development of an integrated instrument that simultaneously captures academic value, developmental benefits, institutional responsiveness, student support services, perceived sacrifices, and student satisfaction within a coherent cost–benefit evaluation framework. Addressing this gap constitutes the primary contribution of the present study.

### **2.3. Linkage of perceived value, cost–benefit appraisal, and student satisfaction in higher education**

Perceived value has become a key explanatory construct for understanding student satisfaction with higher education services, particularly in contexts characterized by increasing marketisation, tuition-based systems, and rising expectations regarding employability outcomes. It is commonly defined as a student’s overall evaluation of the utility of an educational service based on the comparison between what is received and what is given (Quareshi, T. K. (2017).). This “received–given” logic reflects a fundamental cost–benefit appraisal through which students assess whether the academic, reputational, and developmental benefits of their university experience justify the financial and non-financial sacrifices they incur. Empirical research consistently shows that perceived value acts as a proximal determinant of satisfaction and influences behavioral outcomes such as retention and loyalty in service contexts (Sweeney & Soutar, 2001), with similar mechanisms increasingly observed in higher education (Alves & Raposo, 2007; Del Río et al., 2021).

Building on this perspective, the present study conceptualizes perceived value as a higher-order evaluation formed through two components: perceived benefits and perceived sacrifices Quareshi, T. K. (2017). . In higher education, perceived benefits often include teaching quality, institutional reputation, career prospects, and the overall learning experience. Teaching quality represents a core functional benefit and aligns with service quality frameworks such as SERVQUAL (Parasuraman et al., 1988) and sector-specific models like HEDPERF (Abdullah, 2006). Institutional reputation further contributes to perceived value by signaling academic credibility and enhancing the symbolic value of university credentials (Nguyen & LeBlanc, 2001). Career prospects also represent a critical outcome-oriented benefit, as students increasingly evaluate higher education in terms of employability and career advancement opportunities (Ho et al., 2022).

On the sacrifice side, students consider financial, temporal, and psychological investments associated with higher education. Tuition fairness plays a particularly important role in fee-based systems, reflecting students’ judgement of whether the price of education is reasonable relative to perceived benefits (Xia et al., 2004). Perceptions of fair tuition therefore shape students’ evaluations of “value for money,” which has been shown to positively influence student satisfaction (Tuan, 2012). Overall, this framework suggests that higher perceived benefits combined with lower perceived sacrifices enhance perceived value, which in turn positively influences student satisfaction. In this way, students’ cost–benefit evaluations of their educational experiences are translated into overall satisfaction judgements (Alves & Raposo, 2007; Del Río et al., 2021).

To better contextualize the theoretical evolution of higher education service quality research, Table 1 summarizes the major conceptual frameworks that have shaped the field over time. The comparison highlights the primary focus, key dimensions, strengths, and limitations of existing models, particularly regarding their treatment of perceived value, economic sacrifice, and cost–benefit evaluation. This synthesis also illustrates how the proposed framework extends prior approaches by integrating multidimensional benefits, perceived sacrifices,

and student satisfaction within a unified higher education service quality instrument.

**Table 1: The major conceptual frameworks**

Model	Primary focus	Main dimensions	Key strengths	Major limitations
SERVQUAL (Parasuraman et al., 1988)	Expectation-performance gap	Tangibles, reliability, responsiveness, assurance, empathy	Foundational service-quality framework	Limited contextual relevance to higher education; weak emphasis on educational outcomes
HEdPERF (Abdullah, 2006)	HE-specific service quality	Academic, non-academic, reputation, access, program issues	Context-sensitive higher education framework	Limited consideration of perceived sacrifice and ROI
HESQUAL (Teeroovengadum et al., 2016)	Hierarchical HE service quality	Teaching, facilities, support services, administration	Strong multidimensional structure	Focuses mainly on institutional performance
HEISQUAL (Abbas, 2020)	Institutional service quality	Teachers' profile; Curriculum; Infrastructure and facilities; Management and support staff; employability, Safety and security; Students' skills development	Incorporates employability and institutional image	Does not operationalize opportunity cost or academic strain
Perceived-value models (Quareshi, Value T. K. 2017; Sweeney appraisal & Soutar, 2001)	Value appraisal	Benefits versus sacrifices	Strong theoretical explanation of perceived value	Not specifically designed for higher education quality measurement
Recent perceived-value studies (Amado et al., 2023; Iskandar et al., 2024; ; Del Río-Rama et al, 2021)	Student perceived value and reputation	Student experience, value, institutional image	Strong linkage between satisfaction	Limited psychometric integration into service-quality instruments
Proposed model	Integrated HE service	Academic value, facilities, support services,	Integrates service quality, cost-benefit evaluation,	Requires further cross-

Model	Primary focus	Main dimensions	Key strengths	Major limitations
	quality evaluation	developmental benefits, digital and responsiveness, perceived cost and academic strain	perceived sacrifice, cultural student validation within a unified framework	

As shown in Table 1, existing higher education service quality models have made important contributions to understanding students' educational experiences and institutional performance. However, most frameworks continue to prioritize service delivery dimensions while providing limited operationalization of perceived sacrifice, opportunity cost, psychological burden, and return-on-investment considerations.

Recent higher education research increasingly suggests that students evaluate universities through broader value-for-money judgments that combine academic, developmental, financial, and emotional considerations (Amado et al., 2023; Iskandar et al., 2024; Supriyanto et al., 2025). Building upon these theoretical developments, the present study proposes an integrated multidimensional instrument that incorporates both benefit-oriented and sacrifice-oriented dimensions into higher education service quality evaluation. The following section further explains the conceptual linkage between perceived value, cost-benefit appraisal, and student satisfaction in higher education contexts.

### 3. Methodology

#### 3.1. Research Design

This study aimed to develop and validate a multidimensional instrument for measuring higher education service quality from a cost-benefit and satisfaction perspective as perceived by students. Given the exploratory nature of identifying context-specific value components and the need for empirical validation, a pragmatic research philosophy was adopted. This philosophical stance allows the integration of qualitative and quantitative approaches to address complex educational phenomena.

This study adopted a pragmatic research philosophy and a sequential mixed-methods design because the development and validation of higher education service quality instruments require the integration of qualitative exploration and quantitative psychometric assessment. Pragmatism is particularly suitable for instrument-development research as it enables the combination of multiple forms of evidence and methodological approaches to address complex educational phenomena (Creswell & Plano Clark, 2018). The study was implemented in two consecutive phases.

The first phase (qualitative) focused on identifying key dimensions of perceived benefits, perceived costs, and satisfaction drivers in higher education institutions (HEIs). Literature review, semi-structured interviews, and focus group

discussions were conducted to generate an initial pool of dimensions and measurement items grounded in students' life experiences. The second phase (quantitative) was designed to validate the newly developed measurement instrument. The scale development procedures followed established guidelines for construct operationalization and psychometric validation as proposed by Hinkin (1998), including item generation, expert review, pilot testing, and large-scale empirical validation.

### **3.2. Sampling and Data Collection**

#### *3.2.1 Qualitative Phase*

Participants in the qualitative phase were domestic undergraduate students enrolled in Vietnamese HEIs. A total of 45 students (26 females and 19 males) participated in the study. Convenience sampling was applied to recruit students from four disciplinary clusters: teacher education (16 students), foreign languages (10 students), technology (9 students), and economics/business (10 students). To ensure adequate exposure to institutional services, eligibility required participants to have completed at least one academic year at their institution. Participants were informed about the research objectives and were allowed to choose between focus group discussion or individual interview formats. Thirty-three students opted for focus groups, while twelve preferred one-on-one interviews.

Consistent with recommendations for optimal focus group size (Krueger, 2002), the 33 participants were divided into four groups. Each session was conducted in meeting rooms within the participating institutions to ensure a familiar and comfortable environment. The composition of each group was varied to capture diverse disciplinary perspectives. All sessions were conducted face-to-face. Prior to data collection, participants were reminded that their responses would be used exclusively for research purposes.

Three core questions guided the discussions:

1. Which aspects of university service quality make you satisfied or dissatisfied?
2. What benefits do you perceive from studying at your current university (in any dimension)?
3. What costs—both tangible and intangible—do you incur while studying at your university?

Three probing questions were further used to deepen reflections on satisfaction, perceived costs and perceived benefits.

Individual interviews lasted approximately 8–10 minutes and primarily focused on eliciting students' immediate perceptions regarding educational benefits, perceived sacrifices, support services, and satisfaction-related experiences. The four focus group sessions ranged from 26 to 42 minutes. All sessions were audio-recorded using mobile recording devices with participants' consent. Although relatively short in duration, the interviews were complemented by focus group discussions that enabled deeper exploration, clarification, and triangulation of emerging themes. This combination of short semi-structured interviews and

group interaction facilitated both breadth and depth in identifying salient dimensions for instrument development.

### 3.3. Qualitative Data Analysis and Results

Qualitative data from 45 participants (four focus groups and twelve individual interviews) were collected using a flexible, open-ended approach. Follow-up prompts such as “why” and “how” were used to elicit deeper explanations. Data collection continued until thematic saturation was achieved, indicated by repetitive patterns in participant responses.

Qualitative data were analyzed using thematic coding. Two researchers independently conducted open coding, compared results through iterative discussion, and grouped related categories into broader thematic dimensions. Multiple rounds of review and researcher triangulation were used to enhance credibility and support instrument refinement. This multi-step analytical approach allowed systematic categorization of recurrent themes while maintaining conceptual alignment with perceived value theory.

The analysis yielded six major themes representing perceived benefits and cost components of higher education service quality. These themes were identified based on frequency, conceptual salience, and their direct relation to perceived benefits and sacrifices experienced by students.

**Table 2: Hierarchical structure of higher education service quality based on cost-benefit analysis and student satisfaction**

Theme	Sub-dimension	Indicators
<b>Perceived Benefits</b>		
1. Academic Value (AV)	1.1 Teaching Effectiveness	Lecturer competence; Assessment fairness
	1.2 Curriculum Relevance & Appropriateness	Curriculum relevance to labour market; Learning outcomes alignment; Academic workload appropriateness
2. Learning Facilities & Resources (LFR)	2.1 Learning Infrastructure	Learning equipment and digital resources; Supporting amenities; Maintenance and hygiene; Safety and security
	2.2 Resource Adequacy	Access to library and digital resources; Availability of learning materials
3. Student Support Services (SSS)	3.1 Administrative Quality	Professional conduct; Procedural transparency; Information accuracy; Timely service delivery
	3.2 Financial & Academic Support	Financial support mechanisms; Academic advisory services
4. Developmental & Career Benefits (DCB)	4.1 Employer Engagement	Employer linkage; Internship support; Career training workshops
	4.2 Skills Development	Extracurricular activities; Lifelong learning skill development; Soft skill enhancement

Theme	Sub-dimension	Indicators
5. Institutional Responsiveness & Digital Experience (IRDE)	4.3 Research & Innovation Engagement	Research participation opportunities; Research support policies; Practical application of student research
	5.1 Institutional Responsiveness	Institutional adaptability; Feedback mechanisms; Improvement actions
6. Perceived Cost & Academic Strain (PCAS)	5.2 Digital Learning Support	LMS effectiveness; Digital resource availability; Technical support; Technology integration
	6.1 Tangible Costs	Tuition and institutional fees; Living expenses; Learning materials and equipment; Supplementary educational expenses
	6.2 Intangible Costs	Foregone income; Academic workload intensity; Time investment; Psychological pressure and stress; Health and recovery burden

The proposed instrument is grounded in the CBA framework and the perceived value paradigm, which conceptualise value as a trade-off between what is received (benefits) and what is given up (sacrifices) Quareshi, T. K. (2017). . In higher education, students evaluate institutional service quality not only in terms of academic and developmental gains but also in terms of monetary, psychological, and opportunity-related costs. Accordingly, the model specifies six first-order latent constructs, organised into a higher-order benefit–sacrifice structure that predicts perceived value and, subsequently, student satisfaction.

Five constructs represent the benefit dimension of higher education service quality. *Academic Value* captures the core instructional and curricular quality of the programme, including teaching effectiveness (lecturer competence and assessment fairness) and curriculum relevance (alignment with learning outcomes, labour market needs, and workload appropriateness). This dimension reflects the intellectual and pedagogical returns that students obtain from their academic engagement.

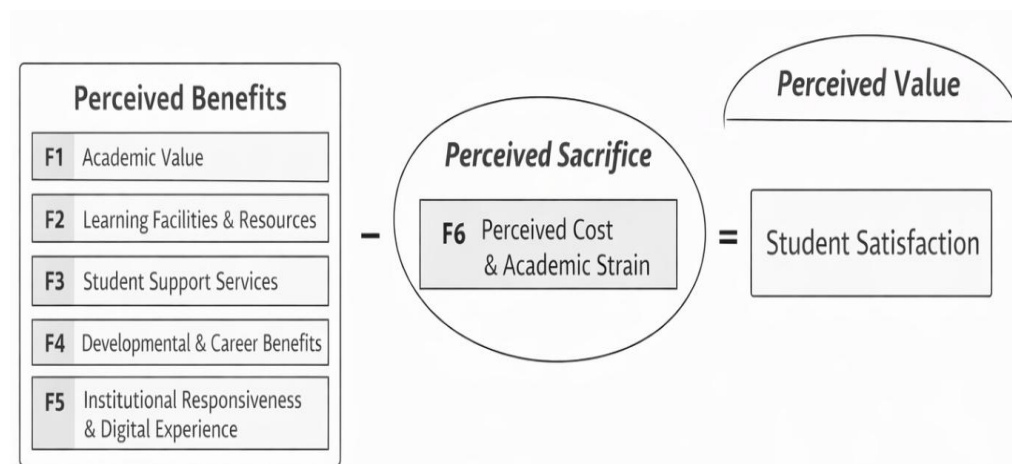
*Learning Facilities and Resources* refer to the adequacy and quality of physical and digital learning infrastructure, including classroom equipment, digital learning tools, supporting amenities, maintenance standards, and campus safety. These elements represent functional resources that facilitate the learning process and enhance educational utility.

*Student Support Services* encompass administrative professionalism, procedural transparency, accuracy of information, timely service delivery, and financial support mechanisms. This construct reflects institutional capacity to reduce friction in students' academic journey and to enhance service accessibility.

*Developmental and Career Benefits* capture long-term outcome-oriented returns, including employer engagement, internship opportunities, skills development (professional and transferable skills), extracurricular enrichment, and student research engagement. This dimension operationalises the career-return and human-capital enhancement aspects of higher education.

*Institutional Responsiveness and Digital Experience* represent governance adaptability and technology-enabled service quality, including feedback mechanisms, improvement actions, LMS effectiveness, digital resource availability, and technical support. This construct reflects institutional agility in responding to student needs in a technology-rich environment.

In contrast, the sixth construct, *Perceived Cost and Academic Strain*, represents the sacrifice dimension. It includes tangible costs (tuition and other educational expenses) and intangible costs such as opportunity cost (foregone income), academic workload intensity, time investment, psychological pressure, and reduced work-life balance. This construct reflects the “give” component in the give-get trade-off.



**Figure 1: Cost-benefit framework of student satisfaction**

At the higher-order level, the five benefit constructs form a second-order latent factor termed *Perceived Benefits*, while *Perceived Cost and Academic Strain* functions as the *Perceived Sacrifice* factor. *Perceived value* is specified as the net evaluative outcome arising from the balance between benefits and sacrifices, consistent with the CBA logic ( $\text{Perceived Value} = \text{Perceived Benefits} - \text{Perceived Sacrifice}$ ). Finally, *Student Satisfaction* is conceptualised as an affective-evaluative response that results from this value appraisal (Oliver, 1997). The model therefore integrates multidimensional service quality attributes into a coherent perceived value framework that explains satisfaction as a consequence of students’ overall give-get evaluation.

Overall, the scale contains 61 measurement items capturing both perceived benefits and perceived sacrifices alongside satisfaction-related judgments. Importantly, the instrument operationalizes perceived value not as a single abstract variable but as a multidimensional evaluative structure linking benefits,

costs, and fairness considerations to overall satisfaction and recommendation intention.

Next, the initial questionnaire was constructed using evidence from literature and qualitative transcripts. Each identified dimension was operationalized through 5–6 measurement items. The resulting instrument comprises six factors, thirteen subdimensions and 61 variables that collectively show perceived value, perceived cost under students' perspectives, through which reflects students' satisfaction. The instrument is organized into three main sections. Section I collects demographic information, including gender, year of study, institutional affiliation, employment status, monthly educational expenditure, and GPA.

Section II contains the core evaluation scale structured around six factors: (1) Academic Value; 2) Development Benefits 3) Institutional Responsiveness & Digital Experience, 4) Student Support Services; 5) Learning Facilities and Resources and 6) Perceived Cost. Each standard includes between five and six items measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Section III includes an open-ended question inviting qualitative suggestions for institutional improvement.

Before proceeding to empirical validation, the instrument underwent a content validation process to ensure conceptual relevance, clarity, and adequacy of construct representation. Content validity is a critical step in scale development, as it ensures that measurement items accurately reflect the theoretical domain under investigation (Hinkin, 1998; Polit & Beck, 2006). The draft instrument was reviewed by nine experts in education and quality assurance in Vietnam. Experts were selected based on their academic qualifications, publication records, and professional experience in educational evaluation and higher education quality management. Experts were asked to evaluate item clarity, conceptual relevance, redundancy, contextual appropriateness, and alignment with the proposed dimensions. Their feedback was collected through structured review forms and follow-up discussions. Several items were subsequently revised, merged, or removed to improve conceptual consistency and reduce ambiguity. Revisions were made based on their feedback regarding clarity, relevance, and conceptual alignment.

In addition to qualitative expert judgment, the content validation process considered the representativeness and conceptual coverage of each construct to strengthen the content validity of the instrument prior to pilot testing. Subsequently, the revised instrument was pilot tested with 65 students from Vietnamese HEIs. Feedback from the pilot phase was used to refine wording, eliminate ambiguities, and improve structural coherence before large-scale administration. The initial instrument consisted of 61 items generated through literature synthesis, qualitative exploration, and expert consultation. During the validation process, several items were removed due to redundancy, low factor loadings, cross-loadings, or conceptual overlap identified through reliability analysis, exploratory factor analysis, and confirmatory factor analysis procedures as detailed in Table 3 below. The final validated instrument retained 50 items

demonstrating satisfactory reliability, convergent validity, and discriminant validity across the proposed dimensions.

**Table 3: Instrument Refinement Process**

Stage	Number of items	Notes
Initial item pool	61	Generated from literature review, interviews, and expert consultation
After reliability analysis	03	Removed redundant/unclear items
After EFA	08	Removed low-loading and cross-loading items (2 rounds)
After CFA	50	Final validated instrument

Following instrument formation, the next stage involved psychometric validation. The instrument was subjected to EFA to examine underlying dimensionality and item loadings. Subsequently, CFA was conducted to test model fit, convergent validity, and discriminant validity. Reliability was assessed using Cronbach's alpha and composite reliability (CR), while Average Variance Extracted (AVE) was calculated to evaluate construct validity. Model fit indices such as  $\chi^2/df$ , CFI, TLI, RMSEA, and SRMR were employed to determine the adequacy of the measurement model.

### 3.4. Questionnaire Administration

Following the final revisions, a large-scale survey was conducted across seven Vietnamese higher education institutions representing diverse disciplinary areas, including teacher education, foreign language education, science and technology, social sciences and humanities, economics, law, medicine, and natural sciences. Data collection took place from October to December 2025.

Both offline and online modes were utilized to enhance response rates. Paper-based questionnaires were administered directly in classrooms, while an online version was distributed via Google Forms through institutional Zalo class groups. Convenience sampling was again employed. A total of 899 responses were received. After screening for completeness and response consistency, 703 valid questionnaires (78.2%) were retained for statistical analysis. Detailed respondent characteristics are presented in Appendix 1.

## 4. Results and Findings

### 4.1. Instrument validation

#### 4.1.1 Reliability Analysis

The measurement instrument was initially designed with six constructs and 61 observed indicators to capture students' perceptions of higher education service quality from a cost-benefit perspective. Reliability analysis was first conducted to evaluate the internal consistency of the scale. Three items (STD3\_11, STD4\_15, and STD6\_5) were removed during this stage because their item-total statistics did not meet the acceptable threshold for reliability. According to Hair et al. (2010), indicators with factor loadings or item correlations below 0.50 should be

considered weak and may reduce the reliability of the construct. After eliminating these items, 58 items were retained for further analysis.

Cronbach's alpha coefficients were calculated for each construct. The results demonstrate very strong internal consistency across all six dimensions, with alpha values ranging from 0.893 to 0.966. In scale development research, Cronbach's alpha values above 0.70 indicate acceptable reliability, while values above 0.90 represent excellent internal consistency (Hair et al., 2010; Nunnally & Bernstein, 1994). The obtained values therefore confirm the good psychometric properties of the measurement instrument.

**Table 4: Reliability statistics by factor (n = 703)**

Factor	Items (n)	Cronbach's Alpha
STD1: Academic Value	12	0.963
STD2: Learning Facilities and Resources	5	0.922
STD3: Student Support Services	12	0.963
STD4: Developmental and Career Benefits	15	0.966
STD5: Institutional Responsiveness and Digital Experience	10	0.962
STD6: Perceived Cost and Academic Strain	4	0.893

As shown in Table 4, the construct *Developmental and Career Benefits* exhibits the highest reliability ( $\alpha = 0.966$ ), followed closely by *Academic Value* and *Student Support Services* ( $\alpha = 0.963$ ). Even the lowest reliability value, observed in *Perceived Cost and Academic Strain* ( $\alpha = 0.893$ ), remains well above the acceptable threshold, indicating that all constructs demonstrate satisfactory internal consistency. Overall, the reliability analysis confirms that the measurement instrument provides a consistent representation of students' perceptions of higher education service quality.

#### 4.1.2 Exploratory factor analysis

Following reliability assessment, Exploratory Factor Analysis was performed to examine the underlying factor structure of the measurement scale and to ensure dimensional validity. Principal Component Analysis with Varimax rotation was employed, and the rotation converged after eight iterations, indicating a stable factor solution.

During the first EFA run, five items (STD4\_12, STD3\_8, STD3\_12, STD3\_10, and STD2\_3) were removed because their factor loadings were below the recommended 0.50 threshold. Hair et al. (2010) suggest that factor loadings below this value indicate insufficient association between the observed variable and the latent construct. After removing these items, 53 indicators were retained for further validation.

The results of EFA revealed a clear six-factor structure, which aligns with the conceptual framework of the study. The factor loadings for the retained items ranged from 0.512 to 0.914, exceeding the recommended minimum value of 0.50. For example, the *Academic Value* construct showed loadings between 0.585 and 0.705, while *Learning Facilities and Resources* ranged from 0.512 to 0.759. The

Student Support Services dimension demonstrated loadings between 0.523 and 0.701, indicating strong convergence of the items within this construct.

The Developmental and Career Benefits factor showed particularly strong loadings (0.544–0.736), reflecting the importance of career outcomes and employability in students' evaluation of higher education service quality. Similarly, the Institutional Responsiveness and Digital Experience construct displayed loadings between 0.572 and 0.676, highlighting the growing role of digital learning systems and institutional responsiveness in shaping student satisfaction.

The strongest loadings were observed in the Perceived Cost and Academic Strain construct, where values ranged from 0.762 to 0.914. These high loadings indicate a strong relationship between students' perceived academic pressure and the cost dimension of higher education services. Overall, the EFA results confirm the multidimensional structure of the measurement model and provide empirical support for the six proposed constructs.

#### *4.1.3 Confirmatory factor analysis*

To further validate the measurement model obtained from EFA, CFA was conducted using AMOS. CFA allows researchers to test whether the observed data fit the hypothesized measurement model and provides a more rigorous validation of the factor structure. During this stage, three additional items (STD1\_11, STD4\_3, and STD3\_9) were removed because they exhibited high redundancy with other indicators, meaning that they measured nearly identical aspects of the constructs. In measurement theory, this phenomenon is commonly referred to as indicator redundancy or item multicollinearity, where multiple items capture the same conceptual meaning and therefore provide limited additional explanatory value.

After removing these items, the final measurement scale consisted of 50 indicators across six constructs.

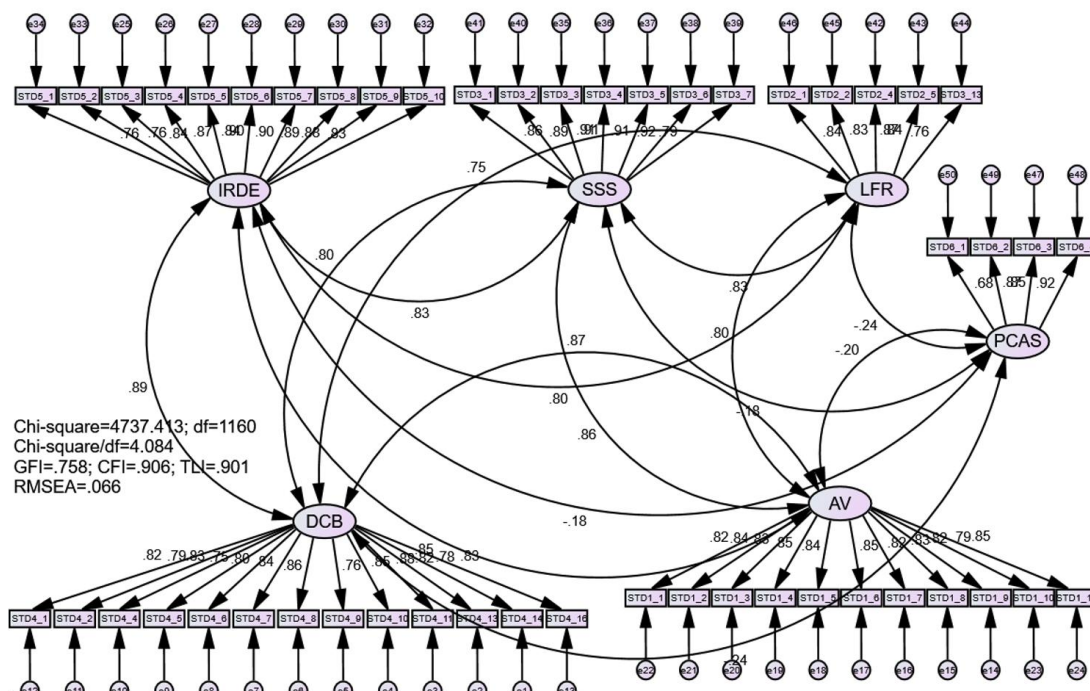


Figure 2: Confirmatory factor analysis

#### 4.1.4 Model fit evaluation

The CFA model fit statistics are presented in Figure 1. The results indicate an acceptable overall model fit. Although the chi-square statistics remained statistically significant, this result is common in large-sample structural models because the chi-square test is highly sensitive to sample size and model complexity (Kline, 2023). Consequently, model evaluation relied primarily on multiple fit indices rather than the chi-square statistic alone. The obtained  $\chi^2/df$  ratio of 4.084, together with acceptable CFI, TLI, and RMSEA values, indicated an acceptable overall model fit for a multidimensional higher education service quality instrument. The Comparative Fit Index (CFI = 0.906) and Tucker-Lewis Index (TLI = 0.901) both exceed the recommended minimum threshold of 0.90, indicating acceptable model fit according to Bentler and Bonett (1980) and Byrne (2010).

Similarly, the Root Mean Square Error of Approximation (RMSEA = 0.066) falls below the recommended upper limit of 0.08, suggesting a reasonable approximation of the model to the population covariance matrix (Browne & Cudeck, 1993). Additional fit indicators also support the adequacy of the model, including RMR = 0.036, which indicates relatively small residual errors between observed and predicted covariances. Taken together, these results demonstrate that the six-factor measurement model provides an acceptable representation of the observed data. The CFA findings therefore confirm the structural validity of the proposed instrument for measuring higher education service quality from a cost-benefit and student satisfaction perspective.

#### 4.1.5 Convergent Validity

After confirming the reliability and factorial structure of the measurement model through EFA and CFA, the next step was to assess convergent validity, which refers to the degree to which indicators of a construct converge or share a high proportion of variance in common.

Convergent validity was evaluated using standardized factor loadings, CR, and AVE. According to Hair et al. (2010), factor loadings should ideally exceed 0.50, while Composite Reliability values should be greater than 0.70, and AVE values should exceed 0.50 to indicate adequate convergent validity. The standardized factor loadings obtained from the CFA ranged from 0.512 to 0.914, which satisfies the minimum requirement suggested in the literature. These results indicate that all indicators demonstrate substantial contributions to their respective latent constructs. Composite Reliability values for the six constructs were calculated and ranged between 0.89 and 0.97, exceeding the recommended threshold of **0.70**.

This confirms that the constructs exhibit strong internal consistency beyond what is measured by Cronbach's alpha. Similarly, the AVE values for all constructs were found to be above 0.50, indicating that each construct explains more than half of the variance of its indicators. According to Fornell and Larcker (1981), AVE values above this threshold indicate that the latent construct adequately captures the variance of its observed variables. Overall, the results confirm that the measurement model demonstrates satisfactory convergent validity, indicating that the indicators are well aligned with their respective constructs.

**Table 5: Convergent Validity of Measurement Model**

Construct	No. of Items	Factor Loading Range	CR	AVE
Academic Value	11	0.585 – 0.705	0.96	0.63
Learning Facilities and Resources	5	0.512 – 0.759	0.92	0.58
Student Support Services	7	0.523 – 0.701	0.96	0.61
Developmental and Career Benefits	13	0.544 – 0.736	0.97	0.64
Institutional Responsiveness and Digital Experience	10	0.572 – 0.676	0.96	0.59
Perceived Cost and Academic Strain	4	0.762 – 0.914	0.89	0.69

The results presented in Table 5 indicate that all constructs meet the recommended thresholds for convergent validity. The relatively high CR values demonstrate strong internal consistency, while the AVE values confirm that the constructs capture sufficient variance from their respective indicators.

#### 4.1.6 Discriminant Validity

After establishing convergent validity, the next step was to examine discriminant validity, which determines whether constructs that are theoretically distinct are also empirically distinct. Discriminant validity was assessed using the Fornell-Larcker criterion, which compares the square root of the AVE of each construct with the correlations between constructs. According to Fornell and Larcker (1981), discriminant validity is achieved when the square root of AVE for each construct is greater than the correlations between that construct and all other constructs.

The analysis revealed that the square root of AVE for each construct exceeded its correlations with other constructs, indicating that each construct shares more variance with its own indicators than with indicators of other constructs. This result confirms that the constructs in the proposed measurement model are empirically distinct and that there is no significant issue of multicollinearity or construct overlap. Therefore, the measurement model demonstrates satisfactory discriminant validity, further supporting the good psychometric properties of the proposed instrument.

#### **4.2. Findings**

The empirical results of this study provide several important insights into the measurement of higher education service quality from the perspective of cost-benefit evaluation and student satisfaction.

First, the analysis confirms that higher education service quality is a multidimensional construct comprising six key dimensions: Academic Value, Learning Facilities and Resources, Student Support Services, Developmental and Career Benefits, Institutional Responsiveness and Digital Experience, and Perceived Cost and Academic Strain. These findings align with previous research emphasizing that service quality in higher education extends beyond teaching quality to include institutional support, infrastructure, and career outcomes.

Second, the results highlight the significant role of academic value and career development benefits in shaping students' perceptions of service quality. The strong reliability and factor loadings associated with these constructs indicate that students place considerable emphasis on the relevance of academic programs, the competence of teaching staff, and the contribution of the university to their future employability.

Third, the dimension of institutional responsiveness and digital learning experience also emerged as a critical determinant of perceived service quality. The increasing integration of digital platforms such as learning management systems and online resources has transformed the educational environment, making technological support an essential component of modern higher education services.

Fourth, the findings demonstrate that perceived cost and academic strain represent an important aspect of students' evaluation of higher education services. Students not only assess the academic benefits they receive but also evaluate the financial and psychological costs associated with their studies. This supports the conceptual framework of the study, which integrates cost-benefit analysis with student satisfaction in evaluating service quality.

Finally, the results of the measurement model validation—including reliability, EFA, CFA, convergent validity, and discriminant validity—confirm that the proposed scale provides a valid and reliable instrument for measuring higher education service quality. The instrument captures both the operational aspects

of service delivery (such as facilities and institutional responsiveness) and the outcome-based dimensions (such as career development and perceived value). Overall, these findings suggest that universities seeking to improve service quality should adopt a comprehensive approach, focusing not only on teaching and infrastructure but also on student support systems, digital learning environments, and the long-term benefits of higher education for students' careers and personal development.

## **5. Discussion and Recommendations**

### **5.1 Discussion**

The findings of this study provide empirical evidence supporting a multidimensional perspective of higher education service quality by integrating cost-benefit evaluation and student satisfaction. The validated model identifies six key constructs that collectively explain students' perceptions of service quality in higher education institutions. The results partially align with previous service quality frameworks such as SERVQUAL (Parasuraman et al., 1988), HEdPERF (Abdullah, 2006), and HEISQUAL (Abbas, 2020). However, the present model extends these frameworks by explicitly incorporating cost-benefit considerations and academic strain, which are often overlooked in traditional service quality instruments.

First, the strong relationships observed between Academic Value and other service quality constructs support the significant role of academic delivery in students' perceptions of higher education quality. This finding is consistent with the SERVQUAL dimension of reliability, which emphasizes the importance of delivering promised educational services effectively. Similarly, the prominence of Developmental and Career Benefits corresponds with the employment quality dimension proposed in the HEISQUAL framework. Abbas (2020) highlights that employability and career readiness have become key indicators of service quality in higher education due to increasing competition in global labour markets.

Second, the close relationship between Learning Facilities and Resources and student satisfaction is consistent with the tangible dimension of SERVQUAL and the infrastructure and facilities dimension of HEdPERF. Previous studies have consistently demonstrated that modern learning environments, access to digital resources, and well-equipped facilities play an essential role in shaping students' educational experiences (Abdullah, 2006; Brochado, 2009).

Third, the results also emphasize the importance of Student Support Services and Institutional Responsiveness and Digital Experience. These findings align with research highlighting the growing importance of administrative responsiveness and digital learning platforms in contemporary higher education environments. With the rapid expansion of digital learning technologies, universities increasingly rely on learning management systems and digital infrastructures to support teaching and learning activities.

A particularly notable contribution of this study is the inclusion of Perceived Cost and Academic Strain as a dimension of higher education service quality. Unlike

traditional service quality models that focus primarily on service delivery and outcomes, this construct captures the perceived psychological and economic costs of education, including academic pressure, workload, and opportunity costs. The negative relationships observed between PCAS, and other constructs suggest that excessive academic strain may undermine students' overall satisfaction with higher education services.

This finding supports emerging research emphasizing the importance of balancing academic rigor with student well-being in modern universities. While academic challenges are essential for learning outcomes, excessive pressure may negatively influence students' perceptions of institutional quality and value.

Overall, the results demonstrate that higher education service quality should be understood as a holistic system involving academic delivery, institutional support, learning environments, career development opportunities, digital infrastructure, and perceived costs of education. This integrated perspective contributes to a more comprehensive understanding of service quality in higher education.

## 5.2 Recommendations

To support benchmarking and quality management, this study proposes a Composite Service Quality Score (CSQS) based on the six validated dimensions, with each dimension standardized to a 0–100 scale and the negative dimension, Perceived Cost and Academic Strain, reverse-coded to ensure interpretive consistency. The overall CSQS is calculated as the weighted sum of the six dimensions, with equal weighting recommended for practical governance purposes due to its transparency and ease of implementation (*see Appendices 3 and 4 for details*). This enables universities to identify strengths and weaknesses across multiple dimensions of educational quality, including academic value, tuition fairness, support services, employability outcomes, and students' academic and psychological experiences.

Accordingly, higher education institutions are encouraged to adopt more student-centered quality assurance approaches that integrate both perceived benefits and perceived sacrifices into institutional evaluation systems and strategic planning. The proposed framework may further support policymakers and quality assurance agencies in promoting evidence-based decision-making, institutional benchmarking, and continuous quality improvement in increasingly market-oriented and accountability-driven higher education environments.

## 6. Conclusion

This study developed and validated a multidimensional instrument for measuring higher education service quality from a cost-benefit and student satisfaction perspective. The findings demonstrate that students evaluate higher education quality not only through institutional performance and academic experiences but also through broader perceptions of value, fairness, developmental outcomes, and perceived sacrifices associated with higher education participation.

Through a sequential mixed-methods approach, the study identified and validated six interrelated dimensions encompassing academic value, learning facilities and resources, student support services, developmental and career benefits, institutional responsiveness and digital experience, and perceived cost and academic strain. The final instrument demonstrated satisfactory psychometric properties, including strong reliability, convergent validity, discriminant validity, and acceptable model fit. The study contributes to higher education service quality research by extending traditional service-performance frameworks toward a more integrated cost-benefit evaluation perspective. In particular, the inclusion of perceived sacrifice dimensions addresses an important conceptual gap in existing higher education service quality models. The proposed CSQS further provides a standardized mechanism for institutional benchmarking and evidence-based quality governance

Overall, the findings suggest that contemporary students increasingly evaluate higher education through multidimensional value judgments that combine academic, financial, developmental, and psychological considerations. Accordingly, higher education institutions should adopt more holistic and student-centered approaches to quality evaluation and institutional improvement. Several limitations should be acknowledged. First, the study employed convenience sampling across selected Vietnamese higher education institutions, which may limit the generalizability of the findings to other educational systems and cultural contexts. Second, the study relied on self-reported student perceptions, which may be influenced by subjective bias and contextual factors. Third, the cross-sectional design limits the ability to examine changes in students' perceptions over time.

Future studies are encouraged to validate the proposed instrument across different national contexts, institutional types, and educational delivery modes. Longitudinal research may further examine how students' cost-benefit evaluations evolve throughout their educational experiences. Future research may also investigate the predictive relationships between the proposed dimensions and broader educational outcomes such as student retention, employability, institutional reputation, and academic performance.

## **7. Conflict of Interests**

We wish to confirm that there are no conflicts of interest associated with this publication. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

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### **Appendix 1: Demographic of respondents**

<b>Gender</b>	<b>Frequency</b>	<b>Percent</b>
Male	136	19.3
Female	567	80.7
Total	703	100.0

<b>School Year</b>	<b>Frequency</b>	<b>Percent</b>
1st	394	56.0
2nd	180	25.6
3rd	95	13.5
4th, 5th, 6th	21	3.0
Graduated	13	1.8
Total	703	100.0

<b>Partime Job</b>	<b>Frequency</b>	<b>Percent</b>
Don't have partime job	359	51.1
Having partime job	344	48.9
Total	703	100.0

<b>Study Discipline</b>	<b>Frequency</b>	<b>Percent</b>
Teacher training	85	12.1
Foreign Languages	196	27.9
Economics	220	31.3
Laws	93	13.2
Medicine	73	10.4
Others	36	5.1
Total	703	100.0

### Appendix 2: Exploratory factor analysis and reliability results

Dimensions	Sub-dimensions	Code	Measurement items	Factor loading	$\alpha$		
Academic Value	Teaching Effectiveness	STD1_1	My lecturers demonstrate strong professional expertise and regularly update their knowledge.	.705	0.966		
		STD1_2	My lecturers' teaching methods help me understand course contents and achieve good learning outcomes.	.647			
		STD1_3	The assessments are conducted fairly, transparently, and consistently.	.615			
		STD1_4	My lecturers provide effective academic guidance and professional consultation.	.640			
		STD1_5	My lecturers motivate students and encourage independent learning.	.655			
	Curriculum Relevance & Academic Appropriateness	STD1_6	The academic value received is commensurate with the time and effort invested in my study.	.636			
		STD1_7	Program learning outcomes and curriculum structure are clearly communicated and accessible.	.659			
		STD1_8	The curriculum aligns with career requirements and labour market demands.	.647			
		STD1_9	The curriculum integrates practical knowledge and professional applications.	.585			
		STD1_10	The academic workload is appropriate for my abilities and available time.	.620			
Learning Facilities and Resources	Learning Infrastructure	STD2_1	Classrooms, equipment, and learning facilities adequately support teaching and learning.	.618	0.922		
		STD2_4	Issues related to facilities and equipment are resolved promptly and effectively.	.613			
		STD2_5	Institutional facilities are commensurate with the tuition fees paid by students.	.759			
	Resource Adequacy	STD2_2	Library services and learning resources sufficiently support students' academic needs.	.512			
		STD3_13	Total study costs are justified by the benefits received from the university.	.558			
	Student Support Services	Administrative Quality	STD3_1	Administrative staff demonstrate professionalism and respect toward students.		.679	0.963
			STD3_2	Administrative requests are handled within the expected timeframe.		.693	
STD3_3			The university responds promptly to students' inquiries and concerns.	.673			
STD3_4			Administrative procedures are transparent and easy to follow.	.701			
Academic Support		STD3_5	Academic support services are accessible and helpful to me.	.679			
		STD3_6	Institutional support services enhance my learning experiences.	.680			
		STD3_7	The university provides a safe and supportive learning environment.	.523			
Developmental and Career Benefits	Employer Engagement	STD4_1	The university provides effective career guidance and employment support.	.686	0.963		
		STD4_2	I have opportunities for internships and professional experiences.	.714			
		STD4_4	Employers generally evaluate graduates from the university positively.	.736			
		STD4_5	I am confident to obtain suitable employment within 12 months after graduation.	.733			

		STD4_6	The university degree enhances my career opportunities.	.638	
	<b>Skills Development</b>	STD4_7	The learning experience improves my soft skills such as communication and teamwork.	.609	
		STD4_8	The program strengthens my digital skills and independent learning capacity.	.590	
		STD4_9	I feel confident about my professional competencies after graduation.	.638	
		STD4_10	The university environment supports comprehensive student development.	.635	
		STD4_11	The university environment promotes balanced development of knowledge and skills.	.627	
	<b>Research &amp; Innovation Engagement</b>	STD4_13	The university supports student research and innovation activities.	0.528	
		STD4_14	Students have opportunities to produce research outputs or innovative products.	0.524	
		STD4_16	Research activities enhance my academic and professional competencies.	.544	
<b>Institutional Responsiveness and Digital Experience</b>	<b>Digital Learning Support</b>	STD5_1	The learning management system effectively supports student learning.	.572	<b>0.962</b>
		STD5_2	I regularly use digital learning platforms provided by the university.	.573	
		STD5_3	Technical issues are resolved promptly and effectively.	.676	
		STD5_4	Digital tools are effectively integrated into teaching and assessment.	.665	
		STD5_5	Digital technologies at the university help reduce my time and learning costs.	.674	
	<b>Institutional Responsiveness</b>	STD5_6	Student feedback is taken seriously by the university.	.644	
		STD5_7	The university provides timely responses to student feedback.	.640	
		STD5_8	Students' opinions are respected in institutional quality improvement processes.	.641	
		STD5_9	The university implements improvements based on student feedback.	.615	
		STD5_10	I am willing to recommend the university based on their experience.	.581	
<b>Perceived Cost and Academic Strain</b>	<b>Intangible Costs</b>	STD6_1	Pursuing higher education involves my significant opportunity costs.	.762	<b>0.893</b>
		STD6_2	I frequently experience high levels of academic stress.	.884	
		STD6_3	Maintaining a balance between my academic and personal life is difficult.	.889	
		STD6_4	The academic workload often causes me feelings of overload.	.914	

**Appendix 3: Standardized composite service quality score framework for benchmarking and quality governance**

Dimension	Coding direction	Standardization formula	Interpretation
Academic Value (AV)	Positive	$S_{AV} = \frac{X_{AV} - 1}{4} \times 100$	Higher scores indicate stronger perceived academic value, including teaching quality, curriculum relevance, academic support, and alignment between learning investment and academic returns.
Learning Facilities and Resources (LFR)	Positive	$S_{LFR} = \frac{X_{LFR} - 1}{4} \times 100$	Higher scores indicate better perceived adequacy of classrooms, equipment, library resources, and institutional learning infrastructure relative to students' needs and contributions.
Student Support Services (SSS)	Positive	$S_{SSS} = \frac{X_{SSS} - 1}{4} \times 100$	Higher scores indicate more effective administrative support, timely problem resolution, accessible student services, and a safe learning environment.
Developmental and Career Benefits (DCB)	Positive	$S_{DCB} = \frac{X_{DCB} - 1}{4} \times 100$	Higher scores indicate stronger perceived developmental outcomes, employability preparation, career support, and long-term personal and professional benefits.
Institutional Responsiveness and Digital Experience (IRDE)	Positive	$S_{IRDE} = \frac{X_{IRDE} - 1}{4} \times 100$	Higher scores indicate greater institutional responsiveness, stronger digital learning support, timely feedback mechanisms, and more effective use of digital platforms and technologies.
Perceived Cost and Academic Strain (PCAS)	Negative (reverse-coded)	$S_{PCAS} = 100 - \left( \frac{X_{PCAS} - 1}{4} \times 100 \right)$	Higher reversed scores indicate lower perceived academic

			strain, lower opportunity cost, and a more sustainable balance between study demands and students' well-being.
<b>Composite Service Quality Score</b>	$CSQS = \frac{S_{AV} + S_{LFR} + S_{SSS} + S_{DCB} + S_{IRDE} + S_{PCAS}}{6}$		Higher scores indicate better overall perceived higher education service quality and stronger institutional performance in service delivery and student-valued outcomes.

**Note:**  $X_i$  refers to the mean score of each dimension measured on a 5-point Likert scale, where 1 = strongly disagree and 5 = strongly agree. All dimension scores are standardized onto a 0–100 scale to enable comparability across constructs. Because Perceived Cost and Academic Strain (PCAS) reflects a negative quality dimension, it is reverse-coded so that higher values consistently represent better perceived service quality. For governance and benchmarking purposes, the simplest specification applies equal weights ( $w_i = 1/6$ ), although reliability-adjusted or SEM-derived weights may be used in future applications.

#### Appendix 4: CSQS interpretation dashboard for institutional benchmarking and quality management

CSQS score range	Quality level	Institutional interpretation
85–100	Excellent service quality	Students perceive very high academic value, strong career benefits, effective institutional responsiveness, and manageable academic workload. Institutional service delivery is performing at an international best-practice level.
70–84	Good service quality	Service quality is perceived positively across most dimensions, though some areas may still require targeted improvement. Academic value and support services are generally strong.
55–69	Moderate service quality	Students perceive mixed experiences regarding service quality. Certain aspects of teaching, facilities, or institutional responsiveness may require improvement.
40–54	Low service quality	Service quality is perceived as insufficient across several dimensions. Students may experience limited academic value, weak support systems, or excessive academic strain.
Below 40	Critical quality concern	Students perceive significant shortcomings in educational services. Academic strain and cost may outweigh perceived educational benefits. Institutional service delivery may be failing to meet minimum quality expectations.

### Appendix 5: The Standardized Survey Questionnaire

Dear ...,

We are a research team from the University of Education, Vietnam National University, Hanoi.

This survey aims to collect students' opinions on the quality of educational services provided by universities under Vietnam National University, Hanoi from the perspectives of cost-benefit analysis and student satisfaction. The results will be analyzed to contribute to improving the quality of education at VNU institutions and higher education institutions in general.

The questionnaire consists of three main sections and takes approximately 10-15 minutes to complete. All information you provide will be kept strictly confidential and used solely for research purposes.

If you have any questions, please contact us via phone: ... or email: ...

We sincerely appreciate your valuable time and participation in this survey.

By completing this survey, you agree to participate in this study.

#### Part I. Personal Information

##### 1. Gender

- Male  
 Female

##### 2. Which year of study are you currently in?

- Year 1  
 Year 2  
 Year 3  
 Year 4  
 Year 5  
 Year 6  
 Graduated

##### 3. Which university under Vietnam National University, Hanoi do you attend?

- University of Languages and International Studies  
 VNU University of Law  
 VNU University of Economics and Business  
 VNU University of Education  
 VNU University of Social Sciences and Humanities  
 VNU University of Natural Science  
 VNU University of Medicine and Pharmacy  
 VNU University of Engineering and Technology

##### 4. Are/Were you currently working part-time while studying at the university?

- Yes  
 No

##### 5. What is your average monthly expenditure (excluding tuition fees) related to your studies (e.g., accommodation, transportation, food, learning materials, etc.)?

- Less than 3 million VND  
 4-6 million VND  
 7-10 million VND  
 More than 10 million VND

##### 6. What was your GPA in the most recent semester?

- Below 3.0/4.0  
 3.0-3.4  
 3.5 or above

## Part II. Level of Agreement

Please indicate your level of agreement with the following statements based on your personal learning experience at your university.

1 = Strongly disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly agree

### 1. Academic Value

No.	Code	Item	1	2	3	4	5
1	STD1_1	My lecturers demonstrate strong professional expertise and regularly update their knowledge.					
2	STD1_2	My lecturers' teaching methods help me understand course contents and achieve good learning outcomes.					
3	STD1_3	The assessments are conducted fairly, transparently, and consistently.					
4	STD1_4	My lecturers provide effective academic guidance and professional consultation.					
5	STD1_5	My lecturers motivate students and encourage independent learning.					
6	STD1_6	The academic value received is commensurate with the time and effort invested in my study.					
7	STD1_7	Program learning outcomes and curriculum structure are clearly communicated and accessible.					
8	STD1_8	The curriculum aligns with career requirements and labour market demands.					
9	STD1_9	The curriculum integrates practical knowledge and professional applications.					
10	STD1_10	The academic workload is appropriate for my abilities and available time.					
11	STD1_11 (Deleted in validation process)	The quality of the study program is commensurate with the tuition fees and related study costs.					
12	STD1_12	The curriculum is periodically reviewed and updated.					

### 2. Learning Facilities and Resources

No.	Code	Item	1	2	3	4	5
13	STD2_1	Classrooms, equipment, and learning facilities adequately support teaching and learning.					
14	STD2_2	Library services and learning resources sufficiently support students' academic needs.					
15	STD2_3 (Deleted in validation process)	I have convenient access to regularly use digital learning materials and online resources provided by the university.					
16	STD2_4	Issues related to facilities and equipment are resolved promptly and effectively.					
17	STD2_5	Institutional facilities are commensurate with the tuition fees paid by students.					

### 3. Student Support Services

No.	Code	Item	1	2	3	4	5
18	STD3_1	Administrative staff demonstrate professionalism and respect toward students.					
19	STD3_2	Administrative requests are handled within the expected timeframe.					
20	STD3_3	The university responds promptly to students' inquiries and concerns.					

21	STD3_4	Administrative procedures are transparent and easy to follow.					
22	STD3_5	Academic support services are accessible and helpful to me.					
23	STD3_6	Institutional support services enhance my learning experiences.					
24	STD3_7	The university provides a safe and supportive learning environment.					
25	STD3_8 (Deleted in validation process)	Information regarding tuition fees and related charges is clearly disclosed, transparent, and easily accessible.					
26	STD3_9 (Deleted in validation process)	The current tuition fee level is reasonable relative to the quality of educational services I receive.					
27	STD3_10 (Deleted in validation process)	The university's scholarship and financial aid policies adequately meet students' needs.					
28	STD3_11 (Deleted in validation process)	During my studies, I experienced considerable financial pressure due to tuition fees and/or related educational expenses.					
29	STD3_12 (Deleted in validation process)	Financial inquiries or complaints are handled promptly and satisfactorily by the university.					
30	STD3_13	The total cost of studying (tuition and related expenses) is justified by the benefits I receive from the university.					

#### 4. Developmental and Career Benefits

No.	Code	Item	1	2	3	4	5
31	STD4_1	The university provides effective career guidance and employment support.					
32	STD4_2	I have opportunities for internships and professional experiences.					
33	STD4_3 (Deleted in validation process)	I have opportunities to participate in networking activities with employers organized by the university.					
34	STD4_4	Employers generally evaluate graduates from the university positively.					
35	STD4_5	I am confident to obtain suitable employment within 12 months after graduation.					
36	STD4_6	University degree enhances my career opportunities.					
37	STD4_7	The learning experience improves my soft skills such as communication and teamwork.					
38	STD4_8	The program strengthens my digital skills and independent learning capacity.					
39	STD4_9	I feel confident about my professional competencies after graduation.					
40	STD4_10	The university environment supports comprehensive student development.					
41	STD4_11	The university environment promotes balanced development of knowledge, skills, and attitudes.					
42	STD4_12 (Deleted in validation process)	I have opportunities to participate in scientific research activities during my university studies.					
43	STD4_13	The university supports student research and innovation activities.					
44	STD4_14	Students have opportunities to produce research outputs or innovative products.					

45	STD4_15 (Deleted in validation process)	The university's academic environment encourages research and innovation.					
46	STD4_16	Research activities enhance my academic and professional competencies.					

#### 5. Institutional Responsiveness and Digital Experience

No.	Code	Item	1	2	3	4	5
47	STD5_1	The learning management system effectively supports student learning.					
48	STD5_2	I regularly use digital learning platforms provided by the university.					
49	STD5_3	Technical issues are resolved promptly and effectively.					
50	STD5_4	Digital tools are effectively integrated into teaching and assessment.					
51	STD5_5	Digital technologies at the university help reduce my time and learning costs.					
52	STD5_6	Student feedback is taken seriously by the university.					
53	STD5_7	The university provides timely responses to student feedback.					
54	STD5_8	Students' opinions are respected in institutional quality improvement processes.					
55	STD5_9	The university implements improvements based on student feedback.					
56	STD5_10	I am willing to recommend the university based on their experience.					

#### 6. Perceived Cost and Academic Strain

No.	Code	Item	1	2	3	4	5
57	STD6_1	Pursuing higher education involves my significant opportunity costs.					
58	STD6_2	I frequently experience high levels of academic stress.					
59	STD6_3	Maintaining a balance between my academic and personal life is difficult.					
60	STD6_4	The academic workload often causes me feelings of overload.					
61	STD6_5 (Deleted in validation process)	Despite these trade-offs, I believe that the long-term benefits of pursuing higher education outweigh the opportunity costs I have incurred.					

### Part III. Suggestions

In your opinion, what improvements should the university make to enhance educational quality and increase your satisfaction?

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