



Understanding Customer Expectations for Premium Rail Services: A Study of Vande Bharat Express

Raja Mukhopadhyay¹, Mista Roy Chowdhury², Harsh Jadhav³, Vinaya A⁴,
Karan Nilesh Radia⁵

^{1,2,3,4,5}Faculty of Management Sciences (FMS), Adani University, Ahmedabad, India
rajamukhopadhyay.im24@adaniuni.ac.in

Abstract. Premium rail services in India have largely emphasized speed and technological advancement; however, passenger evaluation of such services depends on how value is experienced during the journey. This study examines how onboard physical amenities and onboard service experiences influence customer satisfaction and willingness to pay for the Vande Bharat Express, with hedonic and utilitarian value acting as mediating mechanisms. Building on insights from qualitative study that confirmed key experiential constructs, the research adopts a quantitative approach and focuses exclusively on onboard facilities, as offboard premium facilities are not yet consistently available for measurement. Survey data were collected from 224 passengers who had travelled on the Vande Bharat Express and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The results indicate that onboard physical amenities exert a stronger influence than onboard service experiences in shaping passenger value perceptions. Hedonic value plays a more prominent role in explaining customer satisfaction, while utilitarian value is more influential in determining willingness to pay, suggesting that emotional comfort and functional efficiency operate through distinct evaluative pathways. The study contributes to premium rail service literature by empirically validating a value-based framework that explains how onboard experiences translate into passenger satisfaction and fare acceptance. The findings offer practical insights for experience design, service planning, and value-based pricing within India's emerging semi-high-speed rail network.

Keywords: Onboard Amenities, Premium Rail Experience, Customer Experience

1 Introduction

One of the world's largest railway networks, India's railways have seen major technological and service improvements in the past twenty years. Passenger demand for modern, comfortable, and efficient rail travel has grown with the increase in household income, urbanization, and exposure to international travel. Indicative of this change, Indian Railways launched semi-fast trains, like Gatimaan Express and Tejas Express. However, the introduction of the Vande Bharat Express in 2019 set a new standard for rail travel in India, providing an indigenous, full air-conditioned, technology-based solution to traditional Indian train travel [1]. Increased demand for speed, higher class

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interiors, and digital-enabled services resulted in Vande Bharat being the premier service in India's "Make in India" transport modernization strategy.

The Vande Bharat Express exhibits semi-high-speed capabilities and other design aspects that are enhanced to provide a better passenger experience. These trains have automatic plug doors, big panoramic windows, bio vacuum toilets, GPS based information displays, better ride stability, ergonomic seating, and aircraft-style LED lighting [1]. The demand for this service, based on operational data across the system shows occupancy rates above 95% consistently throughout the country which illustrates the market's acceptance of this premium classification of service. The early research that took place examining the Vande Bharat has been focused on time savings, infrastructure, and station improvements when in reality there has been little to no focus on the onboard experience which is at the centre of how passengers evaluate if they have received value for their premium fare.

Research indicates that the onboard features of the service have a strong impact on perceived service quality and service quality. Cleanliness, comfort level of seats, temperature, usability of toilets, digital screens, and level of noise consistently emerge as highly influential factors when considering a travel experience [2]. Indian studies likewise assessed passengers' evaluation of premium services which were an assessment from the perspective of physical comfort attributes, hygiene factors, and onboard space aesthetics [3] Given that fares on the Vande Bharat are typically 30–60% higher than chair-car services, the onboard environment ought to be commensurate with the premium fares being charged. This makes the assessment of onboard amenities a fundamental characteristic when assessing the value proposition of the service.

Premium travel service experience goes beyond physical infrastructure to include areas including interactions, comfort, ambience, emotional satisfaction, and functional efficiency. The research shows that passengers evaluate premium services using two broad value frameworks: hedonic value (meaning enjoyment from sensory pleasure, ambience, aesthetic, and comfort [4] and utilitarian value (meaning effects of functionality, punctuality, cleanliness, safety, and ease of movement onboard [5], [6]. In that way, these frameworks clarify that the onboard experience is a combination of emotional and functional evaluations that go beyond simple physical amenities. Since passenger trains rely heavily on brand, even small variances in cleanliness, staff responsiveness, and seat ergonomics can change the whole trip experience.

While numerous previous works have commented on Vande Bharat's time savings, station-level deficiencies, and comparative infrastructural issues, there is limited academic literature that focuses on the onboard facilities' perception from the perspective of passengers, and how this perception informs satisfaction and willingness to pay. Existing literature largely focuses on conventional rail systems or metro systems, with a dearth of pertinent studies on semi-high-speed premium trains when it comes to: adequacy of onboard amenities, degree of comfort and ergonomic design, atmospheric and sensory design, functionality of onboard systems reliability and emotional reactions to premium branding [7].

As engaging with the new Vande Bharat train services builds rapidly, across a variety of regions of India, a more in-depth analysis specifically on onboard facilities is

necessary, which can help shape both design, operational policy and pricing [8].

Vande Bharat is being marketed as a premium rail service; however, passengers traveling on different routes provided feedback that there was variation in onboard experience. Passengers reported concerns about cleanliness of restrooms, condition of seats, heating and cooling, and all other digital systems that demonstrated onboard amenities not aligned with a premium experience. Passengers paying a premium level also expect a total experience that includes comfort, efficiency, and enjoyment on an emotional level. This indicated a disconnect between the intended service model and the experience delivered [8].

Therefore, the study aims to explore passengers' perceptions of onboard amenities of the Vande Bharat Express train service, examine how those amenities impact their perceptions of satisfaction, and how that affects their willingness to pay for more premium service. Findings from this overarching study will inform a more coherent, equitable, and experience-driven premium rail service across India [9]

2 Literature Review

Customer experience in rail transport is regarded as having several aspects, consisting of physical aspects, service experience, emotional experience, and perceived value (See table 1). Modern rail travelers evaluate their journeys as a whole and consider not merely speed and safety, but also comfort, atmosphere, punctuality, digital supports and psycho-social well-being. Research has shown that the functional experience of high and semi-high-speed trains, combined with some emotional value, justify any premium to the fare [3]

In an Indian context, evolving passenger expectations are always evolving. Increased urban mobility, higher incomes, safety priorities, and the adoption of digital, are all re-framing what we mean by premium quality in services, especially for flagship products like Vande Bharat Express [4].

2.1 On-Board Physical Amenities

Clearly visible amenities (the most outward-facing portion of rail service quality) are tangible factors. Studies of urban rail systems have concluded that seat comfort, cleanliness, illumination levels, temperature, noise, and restroom cleanliness are some of the strongest predictors of passenger satisfaction [9]. Studies conducted for Indian Railways corroborate that travelers often connect cleanliness, maintenance of the coach, and provision of minimum facilities with their travel experience. Studies of tourists taking the Nilgiris Mountain Railway indicated that low maintenance of toilet facilities, interior of the coach, and seating led to low levels of comfort especially for upscale travelers who expected higher standards [11].

Research from different areas of the world lends support to these assertions; for instance, the studies of Taiwan's high-speed train service have indicated that, of the

perceived quality aspects, only seating comfort, cabin ambience and ride smoothness were significant contributory dimensions [12], Japanese studies have found that superior interior design and components of quality can lead to premium perceptions of a property and thus produce a willingness to pay [8]. Also, as part of global benchmarking and comparing with competitors, modern features, digital signage, and clean toilets were cited by users as key elements to provide a quality onboard experience. The combination of these findings suggests that the expectation of an upper-end service experience for semi-high speed service such as Vande Bharat is being constructed at least in part in relation to the physical environment [13].

2.2 Onboard Service Experience

In addition to physical amenities, the service experience is extremely important in influencing how travellers view the premium nature of their trip. Evidence suggests that behaviors of staff, promptness, quality of communication, and provision of real-time information are key in establishing the emotional quality of the experience [14]. In times of disruption or irregular operational issues, travellers rely quite heavily on clear announcements and depend on staff providing to act proactively on their behalf, which has very much an influence on their sense of trust and security [15].

Scholarships that look specifically at gender characteristics also reflects the significance of service interactions. [2], considered visible staff presence and supportive behavior positively impacted perceived safety for women. Findings from [10] for their study regarding the Delhi Metro confirmed that staff response and support also effect the comfort and confidence of travellers in rail environments. Adding further to studies on service innovation, [16] indicates that traveller satisfaction is insufficient for cognitive stress and uncertainty is reduced when expectations are communicated through digital updates, boarding procedures, and other seamless operational processes. Collectively, each of the studies above implies that service consistency and professional interaction can be essential to maintaining Vande Bharat's premium brand promise.

2.3 Hedonic Value

Hedonic value refers to the pleasure experienced through emotion and the senses when travelling and has become a key dimension in premium transport research. [3] suggest that factors such as ambience, aesthetics, and sensory comfort contribute to emotional satisfaction, which may lead to loyalty and memory. [5] also identified that pleasant in-vehicle environments are beneficial for well-being, indicating that premium passengers support psychological comfort just like functional performance.

The analysis of high-speed rail demonstrates that hedonic features such as quiet cabins, aesthetically appealing designs, panoramic views, entertainment systems, and a feeling of exclusivity can increase perceived value. [3] found that hedonic features contribute almost as much toward rail attractiveness as functional features, resulting in an increase in the willingness to pay by almost 40%. [8] also find that a notion of premium quality or hierarchy and superior service values elicits emotional pleasure that increases satisfaction and behavioral loyalty. For Vande Bharat, its modern design factors like

LED lighting, wider windows, and smoother ride quality play an essential role in creating hedonic pleasure that sets the service apart from traditional trains.

2.4 Utilitarian Value

Utilitarian value involves the tangible aspects of the experience associated with rail travel (i.e., punctuality, timesaving, reliability, quality of information, accessibility, and efficiency). Research emphasizes that utilitarian value is the rational foundation for assessing service quality. [6] demonstrate that reliability, punctuality, and waiting conditions have effects on perceived quality in public transportation. [7] found that passengers value punctuality even when the additional cost of operations is higher, suggesting that it is an essential functional expectation in service.

In India, travellers exhibit a considerable willingness to pay for features that require minimal effort and enhance convenience of transfer, [17] notes that Vande Bharat offers significant time savings in travel—around 14% faster than conventional service at an additional cost—which is statistically different enough to affect utilitarian assessments. Research within the information systems field in transport clearly demonstrates that accurate journey information and real-time information has a substantial impact on perceived convenience and, more generally, stress [18] Utilitarian value benefits premium services like Vande Bharat through operational reliability, perceived smoothness of acceleration, efficient completion of boarding, and reliable operation of onboard systems throughout the operation.

2.5 Customer Satisfaction

Customer satisfaction is the overall assessment of the physical environment, service encounter, functional benefits, and emotional experience. According to the expectation–disconfirmation model, there is satisfaction [19] on when performance coincides or surpasses the expectations of standards. Under the Indian rail context, previous studies have stated that cleanliness, staff behaviour, and comfort were significant contributions to satisfaction [4]. The international literature view satisfaction as consisting of both utilitarian and hedonic outcomes, finding that emotion comfort and perceived reliability contribute to a joint evaluation of overall satisfaction [6]. First-class train customers demand an all-encompassing experience, meaning that a slight miss in cleanliness, communication, or service behaviour can affect satisfaction, even with premium physical features. Customer satisfaction on Vande Bharat follows from the simultaneous boost of amenities, service quality experience, emotional pleasure, and functional management.

2.6 Willingness to Pay

Willingness to pay (WTP) approaches whether the passenger perceives sufficient value for the service compared to its cost. Research on Taiwan's high-speed rail (HSR) by [12] provides evidence of passengers' willingness to pay larger amounts provided that messages regarding comfort, ambience, and exclusivity are communicated [20]

discovered that WTP was affected by both reliability and convenience, especially in relation to the increasing development of door-to-door integrated air-rail services as well. Another factor that predicts WTP is hedonic value, demonstrated that ambience and comfort of a high standard increased willingness to pay.

Table 1. Summary of Literature Review

Author	Title	Objective	Methodology	Key Findings
Millán & Esteban (2004)	Development of a multiple-item scale for measuring customer satisfaction in travel agencies services	Develop satisfaction measurement scale	Scale design	Satisfaction influenced by expectations & emotions
Nathanail (2008)	Measuring the quality of service for passengers on the hellenic railways	Assess rail quality indicators	Service quality modeling	Tangibles such as comfort & cleanliness drive evaluation
Jou, Chien & Wu (2011)	A study of passengers' willingness to pay for business class seats of high-speed rail in Taiwan	Measure premium WTP for comfort	Contingent valuation	Comfort & exclusivity raise WTP
Kim & Han (2011)	The role of utilitarian and hedonic values and their antecedents in a mobile data service environment	Evaluate effect of system and info quality	SEM	System quality & announcements improve utilitarian value
Ettema et al. (2012)	How in-vehicle activities affect work commuters' satisfaction with public transport	Study well-being during travel	Travel well-being survey	Comfortable ambience improves emotional well-being
Chiambaretto et al. (2013)	Measuring the willingness-to-pay of air rail intermodal passengers	Assess WTP for reliability & comfort	Conjoint analysis	Reliability, luggage handling, comfort boost WTP
De Oña et al.	Understanding	Examine	SEM	Punctuality,

(2014)	the travel experience and its impact on attitudes, emotions, and loyalty towards the transportation provider—A quantitative study with mid-distance bus trips	functional attributes		reliability & info quality key drivers
Shen, Xiao & Wang (2016)	Passenger satisfaction evaluation model for Urban rail transit: A structural equation modeling based on partial least squares	Identify determinant s of satisfaction	Survey + SEM	Cleanliness, seating, ambience strongly influence satisfaction
Osaki & Kubota (2016)	Perceptions of premium service and superiority: Why do customers pay more for high-value-added domestic airline services in Japan?	Explore why travellers pay more	Structural equation modeling	Premium perception → satisfaction & WTP
Carteni, Pariota & Henke (2017)	Hedonic value of high- speed rail services: Quantitative analysis of the students' domestic tourist attractiveness of the main Italian cities	Examine hedonic vs functional value	RP-SP modelling	Hedonic ambience increases WTP by up to 40%
Gopal & Shrin (2019)	The impacts of rail transit on the lives and travel experiences of women in the developing world: Evidence	Explore mobility experience	Qualitative interviews	Staff behavior & service reliability shape comfort

		from the Delhi Metro			
Oliveira et al. (2019)	What passengers really want: Assessing the value of rail innovation to improve experiences	Identify innovation needs	Best–worst scaling	Comfort, safety & reliability most valued	
Divya & Nandhini Devi (2020)	A Study on Passengers Satisfaction towards Indian Railway Services (With Special Reference to Madurai City)	Evaluate satisfaction in Madurai division	Survey & descriptive analysis	Cleanliness, coach upkeep, amenities affect satisfaction	
Smith & Ojeda Cabral (2020)	Is higher quality always costly? Marginal costs of quality: Theory and application to railway punctuality	Analyse trade-offs	Cost-utility model	Punctuality highly valued despite higher cost	
Coppola & Silvestri (2020)	Gender Inequality in Safety and Security Perceptions in Railway Stations	Explore gender differences in perceived safety	Survey	Staff presence & assistance improve safety perception	
Ross, May & Cockbill (2020)	The personal and contextual factors that affect customer experience during rail service failures and the implications for service design	Study emotional reactions	Behavioral analysis	Responsiveness shapes emotional comfort	
UIC 2022	Rail Customer Experience Best Practices	Summarize global best practices	Expert review	Digital tools & clean amenities essential	
Bhattacharya (2023)	Vande Bharat premium	Compare VB journey time	Secondary data	VB 14% faster but 52% more	

performance

& pricing

expensive

3 Research Methodology

The research utilized a mixed-method research design that blended qualitative and quantitative methods to gain both descriptive and measurable understanding of passenger perceptions of premium train services in India. The research followed a two-step process where an initial qualitative exploratory phase through focus group discussions (FGDs) was conducted, followed by a quantitative survey for model testing.

The qualitative research methodology of data collection was desired because it allows the information and data to be examined and presented in rich detail, where qualitative inquiry addresses a different question than quantitative approaches [21].

The qualitative phase was an exploratory phase to understand the different aspects that passengers associate with "premium" rail travel. There were two focus group discussions conducted, each having ten participants. The participants were selected through judgmental sampling. In order to gain a range of perspectives, we also used snowball sampling so participants could recommend others that also fit the criteria to participate. The discussions were facilitated in English and Hindi to enable participants to engage more naturally.

The conceptual framework (See figure 1) of this research was constructed based upon established service quality and consumer behaviour literature. The questionnaire was constructed on measurement scales well-established on literature. Adapting measurement scales from existing literature allowed for construct validity and enabled comparison to prior studies. The independent variables Physical Amenities and Onboard service Amenities were adopted, respectively, from [22] and [23]. These constructs highlighted customers' evaluation of concrete attributes such as state of cleanliness, comfort of seating, station buildings, and amenities onboard. The mediating constructs, Hedonic Value and Utilitarian Value, were based on [18] which signifies experiential enjoyment and functional utility from the experience. The dependent variables Customer Satisfaction and Willingness to Pay were measured using scales based on [19] and [24] considering the assessment after traveling and the willingness to pay higher fares.

Different constructs were represented by different items, rated on a 5-point Likert scale from 1 = "Strongly Disagree" to 5 = "Strongly Agree." There were 27 items in the survey that reflected the constructs and were designed to reflect passengers' evaluations of the travel experience, the dimensions of the perceived value and the behavioural intentions that stemmed from it.

Onboard Physical Amenities were evaluated with items measuring the comfort, functionality, and quality of the interior physical environment of the train. These items

measured seat comfort, cabin space, air-conditioning, lighting, bathroom cleanliness, ease of movement, and onboard facilities such as charging stations and real-time information systems. Examples include: "The cabin space on board the Vande Bharat train was comfortable and spacious" and "Onboard facilities were adequate and maintained".

On-board Service Experiences were implemented with items that focused on the passenger's experience regarding availability of information and the digital communication during their journey. This constituted accuracy of real time updates, clarity of announcements, reliability of the system of digital information, and usefulness of digital information. A sample item would be: "The information I received on digital platforms during the journey was accurate and helpful."

Hedonic Value was assessed by items tapping into the emotional and experiential enjoyment related to the journey. This included feelings of pleasure, relaxation, and improved mood during the trip on Vande Bharat. Sample items included: "I enjoy traveling by Vande Bharat" and "I feel good and relaxed during the journey."

Utilitarian Value was evaluated through variables that defined the practical and functionality advantages of the experience of travel. Efficiency, convenience, comfort, and the extent to which the service delivered on the travel needs of the passenger each had a corresponding benefit. Sample items included: "The trip was efficient in meeting my travel needs," and "I was satisfied with the functional qualities of the service."

Customer Satisfaction was measured using items that reflect the passenger's overall evaluation of the service experience. These items assessed expectations, perceived performance, and overall satisfaction. For example, the following statements were included for assessment: "Overall, I was satisfied with my journey by Vande Bharat," and "My travel experience met my expectations or above."

Willingness to Pay was measured using items that related to the passenger's authorized willingness to pay more for the service, based on its perceived value. Acceptance of higher fares and increased value for increased fares are included. Sample items are "I would be willing to pay more for Vande Bharat services" and "it is acceptable to charge a higher ticket price for the comfort and service of the experience."

The study aimed at the passengers who have been on the Vande Bharat Express. As a measure to guarantee the authenticity, the very first question in the survey "Have you personally travelled by Vande Bharat Express?" functioned as a filter. Only those who answered "Yes" were given the liberty to proceed to the detailed questionnaire.

The research gathered data online and in-person at a few train stations in order to capture different types of passengers. After checking the data for completeness and consistency, we collected 224 valid responses that were used in the analysis. Our sample represented passengers with different trip frequencies and passenger types, providing an even representation of customer perceptions across user segments.

The individuals involved in the research volunteered, and before participating in the

research, all individuals provided signed informed consent. No personal identifiers were collected, and the responses were kept confidential and used for the research only. The study employed Partial Least Squares Structural Equation Modelling (PLS-SEM) using SmartPLS 4 to test the proposed conceptual framework. PLS-SEM was selected due to its suitability for predictive research, complex models involving mediation effects, and data that may not strictly satisfy multivariate normality assumptions.

The final phase of the study will include an analytic phase organized around a systematic statistical analysis to examine the hypotheses and relationships of the study variables. Prior to conducting the statistical analyses, missing data, inconsistencies, and outliers will be screened in the data to ensure accuracy in the proceeding analyses. The demographic characteristics of the respondents will be summarized using descriptive statistics and a brief overview of the overall sample profile will be presented. The first part of the analysis considers the direct effects of onboard physical amenities and On-board Service Experiences on customer satisfaction and willingness to pay. Then, the models examine the effects of the independent variables on the mediators, hedonic value and utilitarian value, and their effects on the dependent variables. The results are represented clearly and systematically for reasons of interpretations of both direct effect and the indirect effects in the proposed model.

4 Hypothesis Development

H1: Onboard physical amenities have an effect on customer satisfaction.

Prior research in rail and public transport consistently establishes that passengers form overall satisfaction judgments based on tangible in-vehicle conditions such as seating comfort, cleanliness, lighting, temperature control, and spatial comfort.

Studies show that the physical environment operates as a primary evaluative cue through which passengers assess service performance, especially in premium and semi-high-speed rail contexts where expectations are elevated [11], [14]

H2: Onboard service experiences have an effect on customer satisfaction.

Service encounters during the journey, including clarity of announcements, availability of information, and staff responsiveness, shape passengers' psychological comfort and perceived control. Rail service literature highlights that consistent service communication reduces uncertainty and improves passengers' post-journey evaluations, thereby influencing satisfaction beyond physical infrastructure alone [14] [10]

H3: Onboard physical amenities have an effect on willingness to pay.

Premium transport research demonstrates that passengers accept higher fares when superior physical comfort and cabin quality are perceived to justify price differentials. Evidence from high-speed rail and premium airline studies indicates that interior quality and comfort create perceived premium value, which translates into greater fare acceptance [8]

H4: Onboard service experiences have an effect on willingness to pay.

Passengers' willingness to pay is influenced not only by physical comfort but also by service reliability and information quality during the journey. Prior studies in rail and air-rail intermodal services show that effective communication, service assurance, and operational support enhance perceived value for money, encouraging fare acceptance [20] [16]

H5: Onboard physical amenities have an effect on hedonic value.

Hedonic value in transport arises from sensory pleasure, comfort, and emotional enjoyment during travel. Research on high-speed rail demonstrates that cabin ambience, ride smoothness, and aesthetic design generate emotional gratification, contributing to positive experiential evaluations [5]

H6: Onboard physical amenities have an effect on utilitarian value.

Utilitarian value reflects functional efficiency and ease of travel, which are shaped by tangible onboard features such as seating ergonomics, cleanliness, and information systems. Transport service studies confirm that well-maintained physical environments reduce effort and enhance perceived functional utility of the journey [6]

H7: Onboard service experiences have an effect on hedonic value.

Positive service interactions contribute to emotional reassurance and enjoyment, particularly in premium rail settings. Prior research indicates that staff presence, empathetic communication, and information transparency enhance emotional comfort, which forms a core component of hedonic value [25]

H8: Onboard service experiences have an effect on utilitarian value.

Service efficiency, accuracy of information, and reliability of onboard systems influence passengers' perceptions of convenience and usefulness. Studies grounded in information systems and transport research show that high-quality service information reduces cognitive effort and enhances utilitarian evaluations of travel services [16]

H9: Hedonic value has an effect on customer satisfaction.

Service experience literature consistently establishes that emotional enjoyment and psychological comfort play a central role in satisfaction formation. In rail travel, pleasurable onboard experiences improve overall evaluations of the journey, even when functional performance is held constant [5]

H10: Hedonic value has an effect on willingness to pay.

Passengers are more inclined to accept premium pricing when the travel experience provides emotional pleasure and a sense of exclusivity. Research on premium transport services shows that experiential enjoyment enhances perceived fairness of higher fares [26]

H11: Utilitarian value has an effect on customer satisfaction.

Functional performance, including efficiency, reliability, and ease of travel, forms the rational basis of satisfaction judgments. Public transport studies confirm that utilitarian assessments directly influence passengers' overall satisfaction with rail services [7]

H12: Utilitarian value has an effect on willingness to pay.

Willingness to pay in premium rail services is strongly linked to perceived functional benefits such as punctuality, reliability, and operational efficiency. Existing evidence suggests that passengers accept higher fares when these utilitarian benefits are clearly delivered [26]

H13: Hedonic value mediates the relationship between onboard physical amenities and customer satisfaction.

Transport experience literature identifies hedonic value as an experiential pathway through which physical environments influence satisfaction outcomes. Comfortable seating, ambience, and sensory quality enhance emotional enjoyment, which subsequently informs passengers' overall satisfaction evaluations [27]

H14: Hedonic value mediates the relationship between onboard physical amenities and willingness to pay.

Studies on premium transport services suggest that physical comfort and ambience enhance emotional pleasure, which increases perceived experiential value and acceptance of higher fares. Hedonic value therefore operates as an intervening mechanism between onboard amenities and willingness to pay [28]

H15: Utilitarian value mediates the relationship between onboard physical amenities and customer satisfaction.

Tangible onboard attributes improve perceptions of efficiency, convenience, and functional performance, which in turn shape satisfaction judgments. Public transport studies support utilitarian value as a cognitive mechanism linking physical service attributes to satisfaction outcomes [29]

H16: Utilitarian value mediates the relationship between onboard physical amenities and willingness to pay.

Evidence from consumer behavior research indicates that utilitarian value increases consumers' perceived value of a product/service, which in turn increases their willingness to pay. Studies in online retailing contexts show that utilitarian shopping value positively influences satisfaction and subsequent behavioral intentions, including price-related decisions. [30]

H17: Hedonic value mediates the relationship between onboard service experiences and customer satisfaction.

Service experience research emphasizes that service interactions influence satisfaction

primarily through emotional reassurance and enjoyment. Effective communication, staff responsiveness, and service clarity enhance hedonic value, which subsequently shapes satisfaction evaluations in rail travel contexts [29]

H18: Hedonic value mediates the relationship between onboard service experiences and willingness to pay.

Emotion-based decision-making research shows that affective responses during service experiences influence consumers’ acceptance of premium pricing. Emotional gratification enhances perceived experiential value, thereby affecting willingness to pay. [31]

H19: Utilitarian value mediates the relationship between onboard service experiences and customer satisfaction.

Service information quality and operational reliability reduce cognitive effort and improve perceived usefulness during travel. Transport service literature positions utilitarian value as an intermediary through which service processes influence satisfaction outcomes [32]

H20: Utilitarian value mediates the relationship between onboard service experiences and willingness to pay.

Willingness to pay is shaped by functional evaluations of convenience, reliability, and efficiency enabled through service delivery. Prior evidence confirms that utilitarian value acts as a mediating mechanism between service quality and fare acceptance in transport services [33]

5 Data Analysis

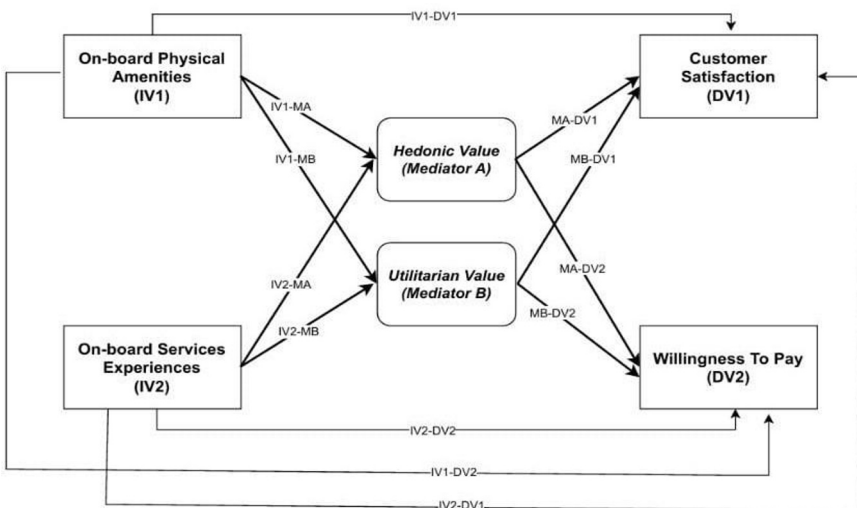


Fig.1. Conceptual Diagram

The current study has employed Partial Least Squares (PLS) Structural Equation Modelling (SEM) in conjunction with SmartPLS 4 to test the model.

The various analyses were performed solely with respect to passengers' onboard experience. All constructs were measured as passengers would view them specifically for the onboard experience; therefore, ticketing or other off-board services were not considered when assessing how passengers viewed their onboard experience. To determine the standard errors and significance level of the estimated paths, bootstrapping was performed with 5,000 sub-samples.

Measurement Model

Reliability and Convergent Validity

Cronbach's Alpha (α) and Composite Reliability (ρ_C) were used in the assessment of proving reliable. The scores for all instruments used, as portrayed by these classifications, were over 0.70, indicating that the instruments are reliable. The establishment of convergent validity through Average Variance Extracted (AVE), which shows that all constructs had an AVE over the required minimum of 0.50 (See Table 2).

Table 2. Construct Reliability and Validity

Construct	A	ρ_C	AVE
Customer Satisfaction (CS)	0.857	0.913	0.777
Hedonic Value (HV)	0.888	0.923	0.749
Onboard Service Experiences (OPA)	0.898	0.922	0.663
Physical Amenities (PA)	0.900	0.921	0.626
Utilitarian Value (UV)	0.863	0.907	0.708
Willingness to Pay (WTP)	0.888	0.930	0.817

Reliability coefficients across the constructs show an acceptable degree of internal consistency. Average Variance Extracted (AVE) indicates appropriate explanatory capability of observed indicators (e.g., measurements) of their associated latent construct.

Discriminant Validity and Coefficient of Determination (R^2)

The assessment for discriminant validity is conducted using the HTMT principle. The HTMT ratios were found to be lower than 0.90 for most HTMT ratios, except for two HTMT ratios (PA-OPA = 0.919; PA-CS = 0.906), which marginally exceed the threshold. Due to the conceptual overlap of physical dimensions between service

experiences in the onboard experience, these two HTMT ratios were retained. The R2 was found to be moderate-high (See table 3)

Table 3. R²

Endogenous Construct	R²
Hedonic Value (HV)	0.543
Utilitarian Value (UV)	0.618
Customer Satisfaction (CS)	0.601
Willingness to Pay (WTP)	0.360

Measurement Model Interpretation

The Measurement Model shows that all latent constructs of this study have sufficient Reliability and Validity. The Internal Consistency Reliability was established through Cronbach's Alpha and Composite Reliability for each Construct (or Latent Variable) of this study, which were found to be above the acceptable Cronbach's Alpha threshold 0.70. The Internal Consistency Reliability indicates the Measurement of the Constructs were stable and reliable across the individual items.

The Convergent Validity of the Measurement Model was confirmed through the Average Variance Extracted (AVE) for each Construct. Each of the 7 Constructs in this study has an Average Variance Extracted (AVE) greater than 0.50, which means that more than one-half of the variance of each of the observed indicator variables has been explained by the corresponding Latent Variables. Thus, the Measurement Scales for each of the 7 Constructs were found to be adequate.

Confirmation of discriminant validity was achieved utilizing the heterotrait-monotrait (HTMT) measure, with almost all of the construct pairs being below the conservative cut-off value of 0.90. While two of the construct pairs narrowly exceeded this cut-off value; they were included in the analysis because their similarities to one another were deemed appropriate in the context of premium rail services' physical and service aspects.

In conclusion, based on reliability and validity assessments, it can be concluded that the measurement model has acceptable psychometric properties and is appropriate for further structural modelling evaluation.

Structural Model

The purpose of the structural model was to determine the relationships (direct and indirect) between the latent variables stated in the conceptual framework. The model was used to determine the impact of Onboard Physical Amenities (PA) and Onboard

Service Experiences (OPA) on Customers Satisfaction (CS) and Customer Willingness to Pay (WTP) (directly) and through both Hedonic Value (HV) and Utilizing Value (UV). The parameter estimates (β) and significance level (p-values), as well as effect sizes (f^2), were calculated using the bootstrap method with 5,000 replications. The analysis of the model focused on the explanatory and predicative power of the model by determining the strength and significance of the hypothesized relationships (see Table 4).

Table 4. Structural Model Results (Direct and Mediated Paths)

Hypothesis	Path	B	p-value	f^2
H1	PA → CS	0.412	0.000	—
H2	OPA → CS	0.359	0.000	—
H3	PA → WTP	0.284	0.000	—
H4	OPA → WTP	0.202	0.004	—
H5	PA → HV	0.412	0.000	—
H6	PA → UV	0.608	0.000	0.308
H7	OPA → HV	0.359	0.000	0.089
H8	OPA → UV	0.205	0.012	0.035
H9	HV → CS	0.541	0.000	0.335
H10	HV → WTP	0.284	0.000	0.135
H11	UV → CS	0.202	0.004	—
H12	UV → WTP	0.205	0.012	0.029

Mediation Effects

To analyse the mechanism whereby experience attributes of the onboard experience affect passenger outcomes, Hedonic Value (HV) and Utilitarian Value (UV) were statistically tested as mediators. Bootstrapping of 5,000 through the use of the resampling method was used to evaluate the statistical significance of the indirect relationship between PA & OPA on CS & WTP and via HV and UV, thereby allowing us to determine if the onboard physical amenities impact passenger satisfaction and willingness to pay through passengers' perceptions of hedonic and utilitarian value. The results of this analysis can be found in the table below (see Table 5).

Table 5. Mediation effects

Hypothesis	Path	B	p-value	f^2
H13	PA → HV → CS	0.541	0.000	H ₁₃ accepted
H14	PA → HV → WTP	0.284	0.000	H ₁₄ accepted

H15	PA → UV → CS	0.202	0.004	H ₁₇ accepted
H16	PA → UV → WTP	0.205	0.012	H ₁₈ accepted
H17	OPA → HV → CS	0.541	0.000	H ₁₅ accepted
H18	OPA → HV → WTP	0.284	0.000	H ₁₆ accepted
H19	OPA → UV → CS	0.205	0.012	H ₁₉ accepted
H20	OPA → UV → WTP	0.202	0.004	H ₂₀ accepted

Structural Model Interpretation

The results suggest that physical facilities and service experiences affect how passengers feel (hedonic) and how well they fulfill their needs (utilitarian). Hedonic value has the greatest effect on customer satisfaction, and utilitarian value has a greater impact on the likelihood of customers being willing to pay for a service. The primary impact of physical facilities occurs on both value types. The results also indicate that all of the endogenous constructs tested have moderate to strong R² values, which indicate their capacity to explain variation.

Overall Model Interpretation



Fig. 2. PLS Sem Result Diagram

Overall, the findings are consistent with the proposed framework that explains how passengers evaluate premium rail services based on perceived value. The structural relationships confirm that an individual's evaluation of the onboard experience affects their overall outcome through both a hedonic (emotional) and utilitarian (functional) experience.

Physical amenities are the most significant antecedent of the model as they have significant effects on hedonic and utilitarian values. Hedonic values are more important when accounting for customer satisfaction; thus emotional comfort, enjoyment, and experiential pleasure are key components/customer evaluations. Utilitarian values have a larger impact when assessing willingness to pay; therefore, functional efficiency and perceived usefulness of fares are also considerations for fare acceptance decisions (See figure 2).

Experiences relate to Onboard services and positively affect customers emotionally and functionally but are still secondary to the physical amenities. The R^2 values demonstrate moderate to strong explanatory ability for each endogenous construct and indicate that the model is appropriate for passenger perception and behavioural intention based on the quality of an onboard experience.

These findings overall confirm that the proposed framework for Premium Rail Service Evaluation is valid and that all three sources of data (physical attributes, service experience, value) should collectively be used when assessing a premium rail service.

6 Discussion

The results suggest that customers do not respond to service attributes in a direct or mechanical manner. Instead, their evaluations appear to be formed through value-based interpretations that combine emotional responses with assessments of functional usefulness.

The findings indicate that onboard physical amenities contribute to both hedonic and utilitarian value. This implies that features such as seating comfort, cleanliness, and overall ambience are not viewed merely as technical necessities. Rather, passengers interpret these elements simultaneously as sources of comfort and as indicators of journey efficiency. This dual role helps explain why improvements in physical amenities often lead to broader positive evaluations, even when core transport functions remain unchanged.

Onboard service experiences show a slightly different pattern. Service-related factors influence outcomes largely by shaping how passengers feel during the journey and how effortless the travel experience appears to them. Interactions with staff, clarity of information, and service responsiveness seem to work by reducing uncertainty and enhancing emotional ease. These effects are not always visible in isolation but become evident once value perceptions are taken into account.

A notable outcome of the analysis is the central role played by hedonic and utilitarian value as mediating mechanisms. Once these value constructs are included, the direct relationships between service attributes and customer outcomes weaken substantially. This suggests that passengers do not translate service quality directly into satisfaction or willingness to pay. Instead, they first interpret the experience in terms of “how enjoyable it felt” and “how useful or efficient it was,” and these interpretations then guide their final judgments. This finding helps clarify why earlier studies in

transport services have sometimes reported inconsistent direct effects of service quality variables.

7 Implications

Theoretical Implications

From a theoretical perspective, the study reinforces the importance of value-based explanations in service evaluation research. Rather than treating satisfaction and willingness to pay as immediate reactions to service attributes, the findings support a layered decision-making process in which value perceptions play an intervening role. By empirically separating hedonic and utilitarian value, the study adds nuance to existing service quality and consumer behavior models that have tended to privilege functional performance over experiential dimensions.

The results also suggest that hedonic and utilitarian value should not be treated as peripheral outcomes but as core explanatory constructs. Their mediating role indicates that they function as interpretive lenses through which customers make sense of service encounters. This contributes to a more precise understanding of how service attributes influence downstream outcomes in premium transport settings.

Managerial Implications

For practitioners, the findings highlight that improving customer outcomes requires more than incremental upgrades to infrastructure or service procedures. Investments in onboard amenities should be evaluated based on how passengers experience them, not only on technical specifications. Features that enhance comfort, reduce fatigue, or create a pleasant travel atmosphere can strengthen both emotional and functional value perceptions.

Service management practices also emerge as critical. Staff behavior, information delivery, and responsiveness may appear routine, but they strongly influence how customers perceive the overall journey. Managers should therefore focus on consistency and ease of experience rather than isolated service excellence moments. Designing services that feel smooth and reassuring can indirectly support higher satisfaction and justify premium pricing.

Policy Implications

At the policy level, the findings suggest that passenger evaluation frameworks should extend beyond operational metrics such as punctuality and capacity utilization. While these remain essential, they do not fully capture how passengers experience premium rail services. Incorporating experiential indicators related to comfort and perceived journey quality may provide a more complete basis for service assessment.

Furthermore, policies that encourage value-enhancing service design can support broader transport objectives. By making premium rail services more attractive in experiential terms, policymakers may facilitate modal shifts from less sustainable transport options. In this sense, value-oriented service standards can contribute to both customer welfare and long-term transport system goals.

8 Conclusion

This study shows that customer satisfaction and willingness to pay in premium rail services are shaped primarily through hedonic and utilitarian value perceptions. Onboard physical amenities and service experiences influence outcomes indirectly by shaping how enjoyable and how useful the journey is perceived to be. The findings highlight the importance of value as an interpretive mechanism in service evaluation. Rather than responding directly to service attributes, passengers assess experiences through emotional and functional lenses. Recognizing this process offers clearer theoretical insight and more practical guidance for service design. Overall, the study emphasizes that meaningful passenger outcomes arise from perceived value, not from ss attributes alone.

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