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C O N T E N T S

An Impact of Service Quality Determinants on Passenger Satisfaction in Konkan Railway: The Moderating Role of Gender and Mediating Effect of Platform Services

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Abstract

Indian Railways connect a wide region of the part of the country where Konkan Railway is an engineering marvel to connect it to Indian Railways. The Konkan Railway, renowned for its engineering excellence, links Roha to Thokur, enabling both passenger and freight transport by significantly enhancing the region's socio-economic development. The study investigates the impact of off-board service quality factors on passenger satisfaction within the Konkan Railway. The study utilises Structural Equation Modelling (SEM) and Mediation Analysis to examine the correlations between these services and passenger satisfaction. A preliminary step, Measurement Invariance of Composite Models (MICOM), is employed to investigate the influence of gender in moderating these relationships with platform services acting as a mediating variable. The research indicates that every off-board service quality factor positively influences passenger satisfaction. Platform services were recognised as crucial mediating factors, connecting various off-board service quality components to overall passenger satisfaction. The MICOM analysis validated the model's robustness and highlighted the significance of the moderator. When examined as a moderating variable, gender revealed no significant disparities in the ratings of off-board service quality between male and female passengers. This indicates that both genders have similar perceptions of the services and enhancements in these areas that equally benefits all passengers. Consequently, gender does not significantly influence passengers' satisfaction with off-board services on the Konkan Railway, facilitating cohesive service improvement initiatives across demographic segments. This study concludes that counter service, waiting room facilities, public announcements, platform services and staff behaviour improve Konkan Railway passenger satisfaction. Platform services mediate and amplify other service quality factors. Although gender doesn't moderate these relationships, the study emphasises platform services as a key passenger satisfaction factor. The Konkan Railway can strengthen its position as a vital link in India's rail network by focusing on these improvements, making passenger travel more pleasant and convenient.

Keywords: Mediation, Moderation, Passenger Satisfaction, Railway Amenities

Introduction

Indian Railways (IR) is one of the world's broadest and vital railway networks, encompassing a large portion of the Indian subcontinent. The public transportation systems are the most efficient means of transportation for passengers and carriages connecting rural areas to dense urban areas, and to satisfy the passengers, high levels of quality services are required on-board and off-board, which helps the passengers or the users of the services to meet their satisfaction and attract the new users (S. Gandhimathi*, 2013). Providing basic amenities off-board and on-board is essential for passengers' satisfaction (Vanniarajan and Stephen, 2008). The Konkan Railway (KR) project was initiated in 1990. It was flagged off on January 26, 1998, Republic Day, connecting a link between the long-isolated west coast region between Mumbai to Mangalore, i.e., the Konkan region, with the rest of the railway network to the country railway network (Shanbhag, Walia and Borges, 2001). Konkan Railway improved connectivity for the passengers and gave more support to the freight volume, but to improve the revenue, the management has to give passenger satisfaction importance by improving facilities which are provided at the off-the-train and on-the-train (Jaiswal *et al.*, 2022).

Literature Review:

The review provides a vast understanding of factors influencing passenger satisfaction across numerous aspects of public transportation systems, including counter services, waiting room facilities, public announcements, platform services, and staff behaviour. (Cao *et al.*, 2016; Verbich and Ahmed, 2016) highlight the significance of service attributes like ease of use, travel cost, safety and many more in enhancing overall satisfaction with transport services while (R.Karthikeyan, U. Geetha, 2015) signifies the security and the waiting room environment in railway transit. (Sarin, 2011; Dr. Shilpi, 2018) highlighted the importance of basic amenities, cleanliness, and comfort in railways, while (Bhattarai, 2019) focused on the role of staff behaviour and

accessibility in determining satisfaction to the passenger. (Anna, Antonello and Paletta, 2014) emphasise the importance of passenger feedback and quality assessment in improving public transport productivity and quality, while (Ghosh, Ojha and Geetika, 2017) explained the need to improve cleanliness and hygiene-related amenities at the railway platform. Additionally, (S. Gandhimathi, 2014) identifies optimistic perceptions regarding punctuality and speed but is dissatisfied with the availability of convenience facilities like drinking water, waiting room services and refreshments at the station.

Research on service quality in public transportation consistently highlights its significant impact on passenger satisfaction with elements such as reliability, comfort, safety and responsiveness influencing user perceptions (Mat *et al.*, 2019). Research indicates that the quality of platform services such as cleanliness, accessibility and signage, significantly influences passenger satisfaction with railway services (Erlangga, Widodo and Siahaan, 2021). The public transport system indicates that enhancements in service quality, particularly regarding platform facilities, are essential for satisfying passenger expectations and promoting a favourable travel experience (Maxwell Sandada, 2015). Furthermore, to the primary and mediating hypotheses, the researchers suggested that gender significantly influences the relationship between service quality attributes and passenger satisfaction. The service sector acknowledged gender as a crucial determinant of profitability and customer satisfaction (Gopal Vasanthi *et al.*, 2023a). Certain researchers investigated that women exhibited greater satisfaction with service quality than men (Kwok, Jusoh and Khalifah, 2016). According (Karatepe, 2011) to women and men exhibit distinct information processing methods. Notwithstanding the biological and physical disparities, women assess product quality and purchase differently than men. The influence of gender impacts the analysis of consumption and satisfaction via socialisation and self-regulation theories. Women integrated the information more effectively than men, who might overlook the service quality attributes (Darley and Smith, 1995). Empirical evidence indicates gender differences in service evaluation and customer satisfaction (Iacobucci and Ostrom, 1993). Together, these studies provide relevant insight into the multifaceted nature of passenger satisfaction, highlighting the importance of various service quality indicators and basic amenities in determining and enhancing the passenger experience and satisfaction in the public transportation system and suggesting areas for improvement to enhance overall satisfaction.

Importance of the Study:
It is pivotal in understanding the multifaceted factors influencing passenger satisfaction in the Konkan Railway. With the railways being a critical mode of transportation in this country, this study will provide valuable insights into how service quality determinants like waiting rooms, public announcements, counter services, etc, impact overall satisfaction. This inclusion of gender as a moderating variable offers a nuanced view of how different passenger segments perceive service quality (Karatepe, 2011; Gopal Vasanthi *et al.*, 2023b), while examining platform service as a mediating factor highlights the integral role these services play in enhancing the travel experience. By identifying key areas for improvement, this study contributes to academic knowledge and offers practical recommendations for railway authorities to enhance service quality and passenger satisfaction.

Statement of the Problem:
Despite the essential role of the railways in transportation, there remains a gap in understating the specific factors that influence passenger satisfaction within the Konkan Railway System. Previous studies like SERVQUAL and SERVPERF have often overlooked the detailed impact of individual service quality determinants and how they interact with demographic variables such as gender. Additionally, the role of platform service in mediating the relationship between service quality attributes and passenger satisfaction has not been thoroughly explored. This lack of comprehensive understanding hinders the development of targeted strategies to improve passenger experiences. Therefore, this study aims to address these gaps by systematically examining the impact of various off-board service quality determinants on passenger satisfaction, considering the moderating effect of gender and the mediating role of platform services.

Objectives of the Study:
The aims of the study are:

1. Evaluate the effect of off-board service factors on passenger satisfaction.
2. Examine how platform service affects passenger satisfaction.
3. Determine whether platform amenities affect passenger pleasure differently based on gender.
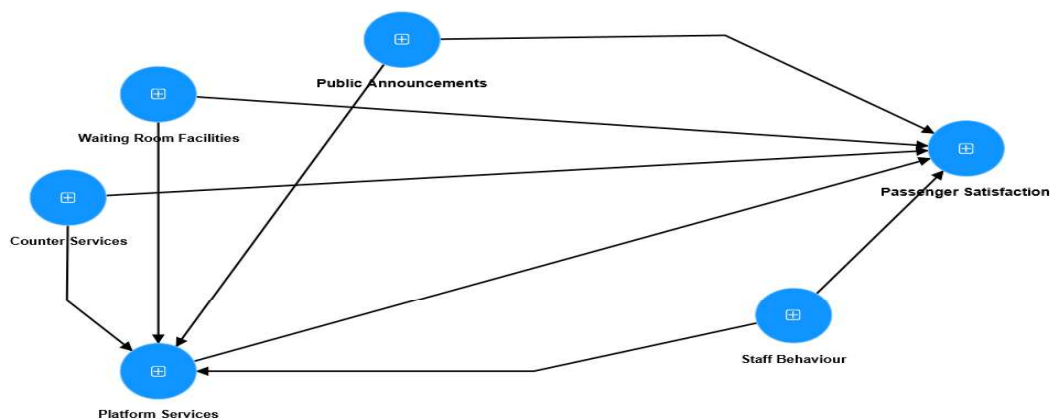
Fig. no.1 Conceptual Model

Hypotheses:

1. H1: There is no statistical relationship between off-board services and passenger satisfaction.
2. H2: There is no significant indirect relationship between off-board services and passenger satisfaction mediated by Platform services.
3. H3: Gender has no significant effect on the relationship between off-board service quality and passenger satisfaction.

Research Methodology:

Survey Design:

The scale used for the research evolved from many other identical studies in the field of public transportation, and the elements from these studies were modified to fit the cultural, economical, and social context of the Konkan Railway. The questionnaire was divided into two parts: the first contained nine items and collected demographic information from responses. Gender, age, marital status, educational qualification, occupation, annual income, place of residence, and reason for the trip were among the demographic variables assessed. A categorical scale was used to assess the above items. The following section was tailored for passenger satisfaction by taking independent variables such as counter services, waiting room amenities, public announcements, platform services, and station staff behaviour; a total of 31 items were examined, and overall passenger satisfaction was assessed using six items from the main study. These items were evaluated using a five-point Likert scale, from 1 (Highly Dissatisfied) to 5 (Highly Satisfied). A pilot test at Madgaon Konkan Railway Station included 200 randomly selected respondents who filled out a questionnaire to discover instrument shortcomings. As per the test results, questionnaire items were altered to increase clarity and uniformity. (Table 1) shows the outcome of the reliability analysis of the pilot test.

Table 1: Construct items and reliability analysis of the instrument.

Sr. No.	Construct	No. of items	Cronbach's Alpha
1	Counter Services	5	0.827
2	Waiting Room Facilities	5	0.837
3	Public Announcement	6	0.794
4	Platform Services	8	0.869
5	Staff Behaviour	7	0.892

Cronbach's Alpha assesses the internal consistency and is a valuable tool to evaluate the construct's reliability. Cronbach's Alpha values equal to or greater than 0.6 are believed to indicate adequate dependability. (Glenn L. Koonce, 2003; Bonett and Wright, 2015; Sharma, 2016; Daud, , Nik Zulkarnaen Khidzir and Abdullah, 2018; Simcox, 2018; Taber, 2018; Mat Nawi *et al.*, 2020; Jugessur, 2022)

Sample Size And Data Collection:

Indian Railway stations are classified into three types: Suburban Group (SG) Stations, Non-Suburban Group (NSG) Stations, and Halt Stations (HS), according to passenger earnings and outbound passengers managed at the station. The Suburban group station is further segregated into three categories i.e. SG1, SG2, and SG3, the Non-Suburban Group station has been segregated into Six categories, i.e. NSG1, NSG2, NSG3, NSG4, NSG5

and NSG6. Similarly, the Halt Station has been segregated into i.e. HG1, HG2 and HG3. The Madgaon Konkan Railway station falls under the NSG2, where the proposed earning of the station is more than 100 crores to 500 crores, and the proposed outward passenger handled at the station is more than 10 to 20 million (Ministry of Railways, 2018). This station is the only station that falls under NSG 2 in the Konkan Railway, which passes from Roha to Thokur (Banerjee, Raghuram and Rangaraj, 2000). 690 self-administrated questionnaires were distributed between May 2023 to April 2024 using convenience sampling techniques (Singh, 2016; Kumuthadevi, 2019; Mageshwarii and Vasanthi, 2020; Saw *et al.*, 2020; Beach *et al.*, 2022) The questionnaire was provided to willing participants to ensure accurate and reliable results. Out of the 690 questionnaires submitted, 12 were rejected owing to incomplete or invalid responses, leaving 678 valid responses for processing, resulting in an effective response rate of 98.26%. Table 2 presents a summary of the respondent profile.

Table 2: Demographic Profile (**n=678**)

Variable	Classification	Frequency	Percentage
Gender	Male	373	55
	Female	305	45
Age (Years)	Below 18	29	4
	18-30	104	15
	31-40	409	60
	41-50	59	9
	51-60	52	8
	Above 60	25	4
Marital Status	Unmarried	395	58
	Married	283	42
Educational Qualification	Below SSC	25	4
	SSC/X	40	6
	HSSC/XII	105	15
	Diploma	102	15
	Graduation	284	42
	Post Graduation	114	17
	Other/s	8	1
Occupation	Student	62	9
	Salaried	262	39
	Businessperson	40	6
	Professional	200	29
	Self-Employed	71	10
	Unemployed	25	4
	Other/s	18	3
Annual Income	Below Rs. 3,00,000	381	56
	Rs. 3,00,001 to Rs. 5,00,000	140	21
	Rs. 5,00,001 to Rs. 7,00,000	60	9
	Rs. 7,00,001 to Rs. 10,00,000	55	8
	Above Rs. 10,00,001	42	6
Nature of Residence	Municipality	394	58
	Village Panchayat	284	42
Travelling with	Family/Relatives	263	39
	Friends/Colleagues	279	41
	Sole	136	20

Variable	Classification	Frequency	Percentage
Purpose of your travel	General	72	11
	Regular Office	211	31
	Business Tour	81	12
	Education	104	15
	Vacation	198	29
	Other/s	12	2

Data Analysis And Tools:

The data in this study was analysed using IBM SPSS statistics version 27.0. The demographic profiles of the respondents are examined as part of the systematic data analysis process. The researcher conducted the analysis using Smart-PLS 4 software.

Common-Method Variance Bias Method:

This study utilised the One Factor Test (Maxwell and Harman, 1968), to assess the potential presence of common-method variance bias among variables.The researcher followed the principles and methodology outlined by (Podsakoff *et al.*, 2003) to conduct a one-factor test, as described by (Maxwell and Harman, 1968). To conduct this test, all the measurement scale items were subjected to a principal component analysis with varimax rotation. This allowed for the identification of any indications of a single factor through factor analysis. The outcome was derived from five distinct components (namely counter services, waiting room facilities, public announcement, platform service, and staff behaviour) obtained from 34 measurement items converged over 6 iterations of rotation.

The subsequent section of the study concentrated on evaluating passenger satisfaction, employing these five service quality dimensions as independent variables. The 34 measurement items were analysed and passenger satisfaction was evaluated using five specific criteria. These were evaluated using a five-point Likert scale, from 1 (Highly Dissatisfied) to 5 (Highly Satisfied). The results substantiated the rigorous methodology and its emphasis on service quality factors to improve passenger satisfaction in the context of Konkan Railway services.

Measurement Model:

The measuring model was assessed for reliability and validity (Joseph E Hair, Jr. G.Tomas M. Hult, Christion M. Ringle, 2014). The study used composite reliability, also known as internal consistency, and convergent & discriminant validity to test the measurement model (Hair *et al.*, 2019; Ibrahim *et al.*, 2023)

Internal Consistency:

Reliability and validity were employed to evaluate the outer strength of the measurement model, which ensures its accuracy and credibility, for use in structural equation modelling. The composite reliability (rho_a) is a measurement used to assess the internal consistency and reliability of the construct. Convergent and Discriminant validity assess the indicators of the same construct are related and distant, respectively (Ibrahim *et al.*, 2023).

Convergent Validity:

It is the degree of the positive correlation between one measure of a specific construct and another distinct construct. The study assessed convergent validity using the following criteria: average variance extracted (AVE) and outer loading. The model produced favourable outcomes, with the outer loading values exceeding the 0.70 limits and the AVE values fulfilling the rule of thumb i.e. above 0.5 recommended by (Hair *et al.*, 2019).

Table 3: Details of Cronbach alpha, Composite Reliability, AVE and Outer Loading.

Constructs	Cronbach's alpha	rho_a	AVE	Outer Loading
Counter Services -CS	0.834	0.835	0.602	0.753-0.796
Waiting Room Facilities-WRF	0.868	0.869	0.656	0.746-0.838
Public Announcement-PA	0.849	0.85	0.571	0.72-0.786
Platform Services-PS	0.888	0.889	0.599	0.727-0.798
Staff Behaviour-SB	0.888	0.889	0.642	0.745-0.833
Passenger Satisfaction -PAS	0.798	0.804	0.555	0.658-0.802

Note: rho_a: Dijkstra-Henseler's rho_a, AVE: Average Variance Extracted.

This study used the Fornell-Larcker criterion and Heterotrait-Monotrait ratio (HTMT) to evaluate discriminant validity. The Fornell-Larcker criterion weighs the square root of each construct's AVE over its correlations with various other constructs (Ibrahim *et al.*, 2023). (Table 4) demonstrates that the study passes the Fornell-Larcker criterion for discriminant validity, which states that every construct square root of AVE surpasses its maximum squared correlation with the other constructs. It also reveals that, except for passenger pleasure, HTMT ratios are significantly lower than the recommended 0.85 level. In general, these findings provide good discriminant validity for all components in the proposed model.

Table 4: Discriminant Validity (Fornell-Larcker criterion and HTMT).

Constructs	Counter Services	Passenger Satisfaction	Platform Services	Public Announcements	Staff Behaviour	Waiting Room Facilities
Counter Services	**0.776**	0.743	0.629	0.545	0.584	0.61
Passenger Satisfaction	*0.904*	**0.745**	0.739	0.708	0.658	0.686
Platform Services	*0.729*	*0.874*	**0.774**	0.549	0.58	0.542
Public Announcements	*0.645*	*0.858*	*0.627*	**0.755**	0.456	0.47
Staff Behaviour	*0.678*	*0.794*	*0.652*	*0.523*	**0.801**	0.491
Waiting Room Facilities	*0.715*	*0.822*	*0.616*	*0.543*	*0.56*	**0.81**

Note: The square roots of the AVE are diagonal and bold. Below the diagonal elements are the HTMT values, and above the diagonal elements is the correlation between the construct's values.

Result:

Structural Model:

As part of the Structural model assessment, the first step is to assess the multi-collinearity through Variance Inflation Factors (VIF). VIF values were found to be less than the recommended threshold of 5 in the sample collected and the overall sample (Joseph E Hair, Jr. G.Tomas M. Hult, Christion M. Ringle, 2014) indicates that no multi-collinearity issues exist in the sample.

Furthermore, the proposed hypotheses are tested, and the result in Table 5 shows that all the hypotheses were supported in the complete sample. The result shows that the counter service at the railway station, waiting room facilities on the platforms, public announcements to inform passengers, platform services and staff behaviour are significant towards passenger satisfaction in Konkan Railway at Madgaon Station.
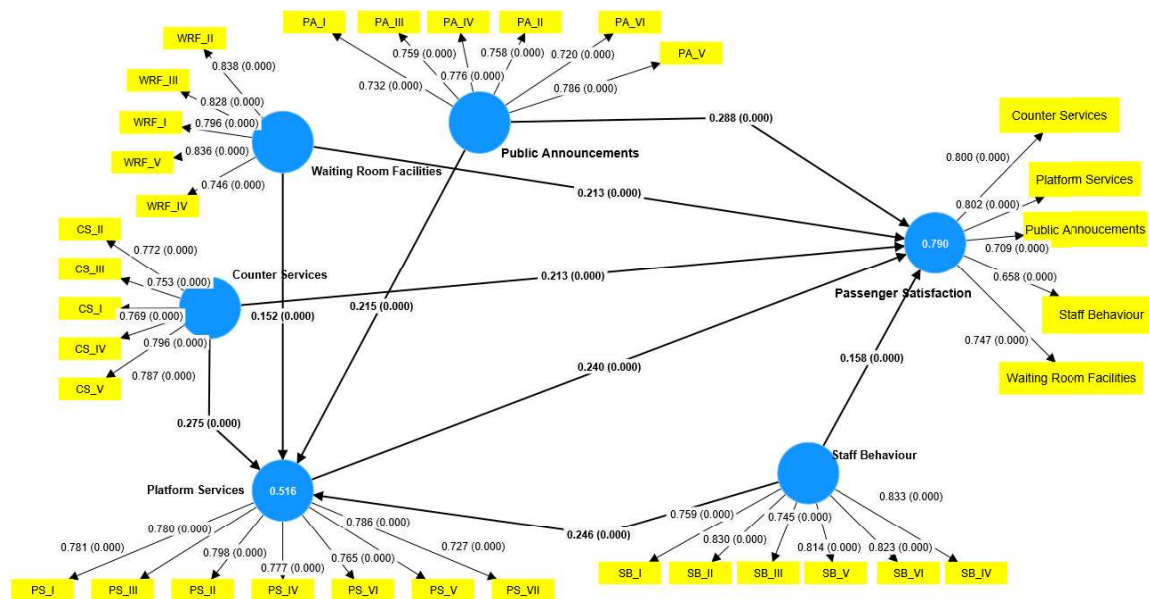
Fig. no. 2 Structural Model

Table 5: Hypotheses Testing results

H. No.	Relationship	β value	T -Value	P values	Remarks
H1$_a$	Counter Services -> Passenger Satisfaction	0.213	6.738	0	Accepted
H1$_b$	Waiting Room Facilities -> Passenger Satisfaction	0.213	8.344	0	Accepted
H1$_c$	Public Announcements -> Passenger Satisfaction	0.288	10.906	0	Accepted
H1$_d$	Platform Services -> Passenger Satisfaction	0.24	8.37	0	Accepted
H1$_e$	Staff Behaviour -> Passenger Satisfaction	0.158	5.184	0	Accepted

The table shows the relationship between various off-board service quality determinants and passenger satisfaction in the Konkan Railway, with all sub-hypotheses (a to e) are accepted based on significant β and P values. Counter services and Waiting Room Facilities show a β value of 0.213, indicating a strong positive impact on passenger satisfaction, supported by high T-values of 6.738 and 8.344, respectively. Public Announcements have the highest impact, with a β value of 0.288 and T-value of 10.906, underscoring their critical role in passenger satisfaction. Platform service also significantly influences satisfaction with a β value of 0.24 and a T-value of 8.37. Lastly, staff behaviour contributes positively with a β value of 0.158 and a T-value of 5.184. All relationships are statistically significant with P values less than 0.05 indicating that improvements in these areas can substantially enhance passenger satisfaction.

Mediation Analysis:

The result of the mediation relationship is presented further, and the results are reported in Table 6. The results revealed a significant indirect effect of counter service on passenger satisfaction through platform services (H2$_a$: β= 0.066, t value=4.964, p<0.0). The total effect of counter service on passenger satisfaction (β=0.279, t value=8.187, p<0.0), with the inclusion of the mediator, the effect of counter service on passenger satisfaction was still significant (β=0.213, t value=6.738, p<0.0). Further analysis of the mediating role of platform service on waiting room facilities and passenger satisfaction i.e. (H2$_b$: β= 0.036, t value=3.307, p<0.001). The total effect of waiting room facilities on passenger satisfaction (β=0.25, t=8.836, p<0.0), with the inclusion of the mediator, the effect of waiting room facilities on passenger satisfaction was still significant (β=0.152, t value =3.536, p<0.0). Furthermore, analysis of the mediating role of platform service on public announcement and passenger satisfaction was significant i.e. (H2$_c$: β= 0.051, t value=4.364, p<0.0). The total effect of the public announcement on passenger satisfaction (β=0.34, t value =12.175, p<0.0), with the inclusion of the mediator, and the effect of waiting room facilities on passenger satisfaction was still significant (β=0.2,15 t value =5.264, p<0.0). At last, the mediating role of platform service on staff behaviour and passenger satisfaction was significant i.e. (H2$_d$: β= 0.059, t value=4.9, p<0.0). The total effect of waiting room facilities on passenger satisfaction (β=0.217, t value =6.998, p<0.0), with the inclusion of the mediator, and the effect of staff behaviour on passenger satisfaction was still significant (β=0.059, t value =4.9, p<0.0). The indirect effect shows a complementary partial mediating role of off-board services in the relationship between counter services, waiting room facilities, public announcements, and staff behaviour to passenger satisfaction (Avkiran and Ringle, 2018). Hence, all mediating hypotheses are supported.

Table 6: Mediation analysis result:

Total Effect			Direct Effect			Rem ark	H. No.	Relationship	Indirect Effect			Percentile bootstrap 95% confidence interval		Remar k
β	T value	P value s	β	T val ue	P value s				β	T val ue	P value s	2.50 %	97.50 %	
0.27 9	8.187	0	0.27 5	6.38 2	0	Signif icant	H2$_a$	CS -> PS -> PAS	0.0 66	4.96 4	0	0.04 1	0.093	Accept ed
0.25	8.836	0	0.15 2	3.53 6	0	Signif icant	H2$_b$	WRF -> PS -> PAS	0.0 36	3.30 7	0.001	0.01 6	0.059	Accept ed
0.34	12.17 5	0	0.21 5	5.26 4	0	Signif icant	H2$_c$	PA -> PS -> PAS	0.0 51	4.36 4	0	0.03	0.076	Accept ed
0.21 7	6.998	0	0.24 6	6.15 9	0	Signif icant	H2$_d$	SB -> PS -> PAS	0.0 59	4.9	0	0.03 7	0.084	Accept ed

In moderation analysis, the primary step to perform is Measurement Invariance of Composite Models (MICOM) and found that in steps 2, step 3a (mean), and step 3b (variance), all the p-values are above the significance level hence the researcher analyse the gender as mediators and analyse Multi-Group Analysis (MGA) to find the impact of gender on off-board services. As a final step, the researcher assessed (Table 7), that no significant difference existed in the effect of gender in terms of the counter service, platform service, staff behaviour, waiting room facilities to platform service to passenger satisfaction. Further, the researcher found a significant relationship between waiting room facilities and passenger satisfaction except one, that means when the gender uses these services, there is a difference in the satisfaction of males and females.

Table 7: Moderation result.

Paths	Path difference in Gender	1-tailed (p-value)	2-tailed (p-value)
Counter Services -> Passenger Satisfaction	0.059	0.173	0.346
Counter Services -> Platform Services	-0.109	0.849	0.303
Platform Services -> Passenger Satisfaction	0.07	0.131	0.263
Public Announcements -> Passenger Satisfaction	0.031	0.28	0.56
Public Announcements -> Platform Services	-0.002	0.508	0.984
Staff Behaviour -> Passenger Satisfaction	0.023	0.352	0.704
Staff Behaviour -> Platform Services	0.097	0.121	0.242
Waiting Room Facilities -> Passenger Satisfaction	-0.175	0.999	0.001
Waiting Room Facilities -> Platform Services	0.008	0.47	0.94

Discussion:

In the current analysis, the influence of the off-board services determinants between the mediating role of platform service and gender plays as moderating effect on passenger satisfaction.

The outcome exposed a significant impact of off-board facilities on the overall passengers' satisfaction, specially within Konkan Railway services. Regarding counter service, results highlight the necessity of adequate ticket availability during peak times, a clear display of train information and reservation charts, the enquiry counter always has staff, and retiring room booking is available. Suggestions include the enhancement of installing complaint and suggestion boxes, also boost the number of ticketing counters or workers at peak times (Dr. Shilpi, 2018). It identifies the need for a passenger-focused approach to improve the counter services and gain a competitive benefit at the station (Fodness and Murray, 2007). Further, waiting room facilities significantly impact passenger satisfaction due to cleanliness, availability of comfortable resting chairs, appropriate bathrooms and washrooms, functional lighting, fans, charging outlets, and accessible free Wi-Fi (Verbich and Ahmed, 2016). Also, the efficient waiting facilities improve passenger comfort before the journey starts (Lunke, 2020). Contrary to this (Sarin, 2011), found a negative impact on passenger satisfaction. The analysis of the study states the importance of public announcements like electronic media announcements are clear, understandable and multilingual, frequent updates to train information, advance notice of arrival and departure times, an announcement for train schedule modifications or delays are made promptly, platform numbers and other important train details are announced in advance. Additionally, staff behaviour demonstrates professional communication skills and discipline, ensures safety during platform emergencies, shows a willingness to help, demonstrates empathy when addressing complaints, and are polite and helpful which significantly impacts passengers' satisfaction. It is also observed that staff members' conduct has an encouraging effect on productivity. Additionally, efforts have been made to increase sustainability and cost-effectiveness in the railway transportation system, further there is a need to comprehend passenger comfort and explore potential strategies and solutions to improve the experience (Patel and D'Cruz, 2018). Lastly, platform services play an important role in passenger satisfaction; it include all off-board services. Shopping has a significant impact on railway passenger satisfaction, with identification for potential growth (Ghosh, Ojha and Geetika, 2017). Passengers have a favourable opinion of amenities such as the reservation charts and refreshment counter but, are dissatisfied with the availability of drinking water, porter behaviour and refreshment quality (S. Gandhimathi, 2014).

At the railway station, platform services such as adequate and easily accessible bookstalls, convenience stores, food & beverage stalls and vendors, baggage trolleys & porter services, proper ventilation, seating arrangements, and digital train information display are key to passengers' satisfaction. The outcome of the analysis demonstrated a positive and substantial impact of counter service, waiting room facilities, public announcement, and staff behaviour on passenger satisfaction and can enhance the satisfaction role. The result of the study consists of (Park and Park, 2018) the impact of services cape (predefined environment) that influences the attributes of passenger satisfaction. The study suggests that effective implementation of platform amenities enhances passenger comfort and directly impacts satisfaction.

Multi-group analysis revealed that there is an insignificant difference in the impact of gender on counter service, public announcement, staff behaviour to passenger satisfaction and counter service, waiting room facilities, public announcement, and staff behaviour to platform services, satisfaction in the waiting rooms differed significantly. This shows an increasing similarity in the male and female responses but waiting room facilities to passenger satisfaction have different significance between gender groups. The station services emphasise the role of moderating variable effects on passenger satisfaction (Sugianto, 2017), the gender perspective exposes that the technologies which are used at the station can positively impact the satisfaction level with differences across genders (Rubio-Andrada *et al.*, 2023).

Finding:

The study reveals critical insights into how various off-board service quality determinants affect passenger satisfaction. The researcher highlights that off-board services such as counter service, waiting room facilities, platform services, public announcements and staff behaviour significantly influence overall passenger satisfaction. The analysis shows that efficient counter services, platform services and well-maintained waiting room facilities are essential for enhancing passenger experiences; the moderating role of gender indicates that male and female passengers have no different expectations and priorities, with females and males, but women place higher importance on safety & security, males may prioritise convenience and efficiency. The mediating effect of platform services underscores their crucial role in bridging the gap between off-board services and overall satisfaction. Improvement in platform services including cleanliness, seating availability and information systems, significantly enhance the travel experience, thereby increasing passenger satisfaction. These findings suggest that targeted improvements in off-board services considering gender-specific needs and focusing on platform services can substantially elevate passenger satisfaction levels in the Konkan Railway.

Recommendations:

According to the study's findings, several recommendations can be proposed to enhance passenger satisfaction in the Konkan Railway:

Invest in improving the off-board amenities like cleaning, regular maintenance and updates to these services can significantly boost passenger satisfaction. Implement and maintain robust safety measures, including surveillance, patrolling personnel, and emergency response protocols. Visible security measures are particularly important for enhancing the perceived safety of female passengers. Streamline the ticketing process with advanced booking systems and training the staff in customer service skills to reduce wait times and improve the overall booking experience. Ensure that the platform is clean, well-lit, and equipped with necessary amenities such as restrooms, and information displays. These improvements can enhance the overall travel experience and act as mediating factors in passenger satisfaction. Recognise and address the different needs of male and female passengers. Implement continuous monitoring and feedback systems to gather real-time passenger insights and address issues promptly. This will help in maintaining high service standards and adapting to changing passenger needs.

Conclusion:

Many studies have been conducted on passenger satisfaction at Konkan Railway, specifically on counter services, waiting room facilities, public announcements at the station, staff behaviour and platform services outlining both, positive and negative aspects of railway platform services (Geetika and Nandan, 2010). This study provides valuable insight by identifying the factors that influence passenger satisfaction with the quality of off-board services offered by Konkan Railway Station at Madgaon. This research is based on empirical evidence.

The announcements at the station are clear and understandable, such as frequent train information and platform detail announcements, announcements in multiple languages, advance announcements of train arrival and departure time, prompt announcements of train rescheduling, modifications or delays, and other details. The behaviour of staff incorporates aspects like the demonstration of professional communication skills, the assurance of safety during platform emergencies, the exhibition of professional and disciplined behaviour, the display of willingness to assist, the demonstration of empathy while addressing complaints and the display of

politeness and helpfulness by counter service staff. At the platform, a wide range of services such as pleasant ambience, accessible bookstalls and convenience stores, food & beverage stalls and vendors, baggage trolleys and porter services, proper ventilation, seat arrangement for passengers and accurate digital train information available. The aforementioned characteristics are determinants of overall satisfaction with Konkan Railway. The study guides the Konkan Railway administration in identifying areas for service improvement and enhancing happiness, particularly in the context of off-board services.

Limitation Of The Study:
Although the analysis contributed to passenger satisfaction in the study, there are some limitations. Initially, convenience sampling was employed, rendering the response-refusal rate indeterminable. Consequently, the outcome cannot be universally applied. Nevertheless, despite being tested with a convenience sample, the model is fundamentally exploratory and offers a solid foundation for further research. The research is only done on NSG-2 where other NSG, SG and HS are not taken into consideration for analysis. Future studies could cover all NSG and HS of Konkan Railway station. More determinants can be determined related to counter services, waiting room facilities, public announcements, staff behaviour, and platform services. Apart from the above services, many services can be considered off-board services. Last but not the least, future studies could be incorporated with Indian Railway, which can capture the real emotions of the passengers during the on-board journey and take benefits from off-board services and analyse how they are satisfied and loyal towards Indian Railway and Konkan Railway.

Scope for Further Research:
Future research could build on this study's findings by adopting a longitudinal design to capture changes in passenger satisfaction over time. Expanding the geographic scope to include other railway networks would provide comparative insights and enhance the generalizability of the results. Future research scope to explore a wider range of service quality determinants like ticket pricing, travel time, and technological advancement in railway services. Utilising qualitative methods, such as interviews and focus groups, can yield more profound insights into passenger experiences and expectations. Experimental designs to test the effectiveness of specific service improvements and the development of new measurement models for service quality, addressing the limitation of existing techniques like SERVQUAL and SERVPERF, are also recommended. Lastly, future research should look into combining new technology, such as real-time feedback systems and data analytics, to monitor and enhance passenger satisfaction continuously.

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