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Abstract: Using a multimethod approach, this study evaluates consumer satisfaction with service quality at petrol stations in Islamabad/Rawalpindi and Lahore, Pakistan. To examine the aspects driving consumer impressions, we employ a combination of exploratory factor analysis (EFA), importance-performance analysis (IPA), and regression analysis. The study uses EFA to identify critical criteria such as tangibility, reliability, assurance, and empathy, which will serve as the foundation for additional investigation. The IPA identifies areas for improvement, including washroom cleanliness, first aid, and fair pricing in tuck shops. Regression research demonstrates the importance of reliability in total customer satisfaction. One limitation of the study is its regional emphasis. Future study directions involve broadening the

geographic scope, considering diverse populations, and examining the impact of emerging technologies. The study provides significant information for petrol station managers looking to strategically improve service quality and customer loyalty in a competitive sector.

Keywords: customer satisfaction; importance-performance analysis; IPA; fuel station service quality.

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Biographical notes: Syeda Dua e Zahra is an emerging researcher with a keen interest in customer experience, service quality, and consumer behaviour within the retail and fuel service sectors. Her academic work focuses on understanding customer expectations and evaluating service performance through analytical frameworks such as importance-performance analysis (IPA). Through her research, she aims to contribute practical insights that help businesses improve customer satisfaction and operational efficiency. She is passionate about bridging the gap between theoretical research and real-world business practices, particularly in industries where customer interaction and service standards play a vital role in shaping brand perception and long-term customer loyalty.

Ayesha Arshad is a dedicated researcher with interests in customer service, business management, and consumer satisfaction studies. Her academic contributions focus on analysing service quality and identifying factors that influence customer experiences across various industries. Through her research, she seeks to provide practical recommendations that help organisations improve service standards and strengthen customer relationships. She is particularly interested in applying analytical and performance evaluation methods to real-world business challenges.

Farooq Ahmad is an accomplished academic researcher and a PhD with a strong interest in service quality, customer behaviour, and business performance analysis. His research work focuses on examining consumer expectations and identifying strategies that enhance customer satisfaction across service-oriented industries. Dedicated to continuous learning and innovation, his scholarly efforts aim to promote effective management practices and contribute positively to the fields of marketing, customer experience, and business research globally.

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Belal Mahmoud Alwadi is a dedicated researcher with academic interests in business development, entrepreneurship, service quality, and customer satisfaction. His work focuses on exploring innovative business strategies and entrepreneurial practices that contribute to sustainable growth and improved organisational performance. Through analytical research and practical insights, he examines how businesses can strengthen customer relationships while adapting to changing market demands. He is particularly passionate about entrepreneurship-driven innovation and the role of effective management in building competitive and sustainable enterprises. His research aims to bridge academic knowledge with real-world business applications, contributing valuable perspectives to the fields of business management, entrepreneurship, and service industry development globally.

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1 Introduction

Fuel stations have been around for a long time, since vehicles became popular in the early 1900s. They are typically placed strategically along roads and highways for convenient access. Fuel stations offer a variety of fuels, including gasoline and diesel, as well as alternative fuels such as compressed natural gas or electric charging stations for electric vehicles (Abdul Shukor et al., 2022). Various firms, including oil companies and independent entrepreneurs, can run these stations. These stations have procedures to ensure the fuel is safe and of acceptable quality. Service quality plays a crucial role in every company's activity; it directly influences customer satisfaction and overall business performance. Customer expectations are essential in determining service quality because they are the benchmark against service performance. To ensure client pleasure and loyalty, service providers must understand and satisfy their expectations. In petrol stations, service quality includes things like convenience, fuel price, fuel quality, cleanliness, customer service, amenities, and overall consumer experience. These service quality variables together work to shape customers' perceptions and determine whether the customers return to the same location. High service quality directly leads to customer satisfaction, which influences behavioural intentions like repeat purchases, positive word of mouth.

Several studies have been conducted in developed countries, such as Europe, to evaluate the service quality of petrol stations, focusing on consumer perceptions. These nations are well developed and provide excellent services, with a significant growth in automated filling stations. Over the years, European petrol stations have evolved in response to evolving technology.

These stations are often positioned strategically along important transit routes, making them easily accessible to cars. Alternative fuels are becoming more widely available at petrol stations in European countries as the region works to cut greenhouse gas emissions and combat climate change (Alkhalil et al., 2021). Many gas stations provide various extra services to clients, such as convenience stores, vehicle washes, and rest areas. These stations help to maintain high hygiene and provide necessary services. Their employees are well-trained, polite, and capable of assisting consumers with questions. Many petrol stations provide a variety of payment alternatives, such as credit cards and contactless payments, to promote consumer convenience.

There has been a recent trend toward alternative energy sources, such as electric vehicles and hydrogen fuel cells, with several European nations establishing electric vehicle charging facilities and hydrogen filling stations alongside regular petrol pumps. Most gasoline stations maintain high standards, although there are still variances in quality and service depending on the region.

In new and emerging countries, where the infrastructure and customer expectations change intensely, we are less familiar with how the service quality factors operate. So there is limited research in economies that are currently transitioning toward innovation or modern infrastructure on how service quality factors, such as washroom cleanliness, fair pricing, fuel quantity, and customer satisfaction, shape customer satisfaction at filling stations. This gap emphasises the need for more research to understand how service quality is perceived in less developed economies' retail sectors

1.1 Service quality challenges in an emerging economy like Pakistan

In Pakistan, Burmah Oil Company (formerly British Petroleum) created the first fuel station in Karachi in 1914, while the nation was under British colonial administration. Initially, they provided services to British officers and automobiles. Following Pakistan's independence in 1947, the gasoline station infrastructure continued to grow. State-owned firms such as Pakistan State Oil (PSO) and Attock Petroleum significantly extended the gasoline station network. Over time, private enterprises entered the industry, resulting in increased competition and the continued expansion of gasoline stations

The availability and accessibility of petrol stations in Pakistan were investigated by Abdullah et al. (2019). Their findings suggest that the geographical arrangement of fuel stations is critical to maintaining a continuous fuel supply across the country. They discover that fuel stations are evenly dispersed throughout metropolitan regions, whereas rural areas encounter barriers due to restricted fuel station access. The creation of contemporary fuel stations with cutting-edge technology, such as electronic payment systems and fuel monitoring equipment (Zahid et al., 2020). The implementation of digital fuel monitoring devices has helped to reduce fuel theft (Hossain et al., 2024).

In Pakistan, Verhoef et al. (2009) state that one of the most important variables influencing the quality of fuel stations is the prevalence of 'white pumps', which refer to fuel stations that the government does not license to sell petrol. These unlicensed gasoline outlets damage fuel quality and fail to fulfil safety standards, which is the primary concern of customers when purchasing fuel. In recent years, the government of Pakistan has taken initiatives to enhance service quality and safety at petrol stations. They conduct frequent inspections and enforce rigorous guidelines to meet quality requirements.

However, there is still room for development. Typical complaints include long queues, non-operational amenities such as bathrooms or vehicle wash areas, and a lack of

skilled staff. Meters do not always measure accurately or provide the correct quantity of fuel. If pricing is not a big concern for the client, customers may lose money because they pay more for fuel than they receive. So these service quality challenges reduce customer satisfaction, which highlights the need to address these factors and their influence on customers' perception

1.2 Significance of the study

Studying fuel stations and service quality is critical because it influences customer satisfaction, brand reputation, competition, company success, regulatory compliance, and staff happiness. Improving service quality may lead to more loyal clients, good word-of-mouth, increased sales income, and a happier workforce. So, in this study, we investigate the influence of fuel station services on customer perception in the Pakistani setting using IPA analysis. This study is critical for fuel stations to prosper, please consumers, and maintain competitiveness.

To fill this gap in emerging economies like Pakistan, this study intends to analyse fuel stations' service quality perspective to enhance their services. Bisht and Rai (2020) emphasise the need to understand and improve many dimensions of perceived value to attract and keep consumers at gasoline stations.

2 Literature review

Service quality is an important component influencing consumer happiness and overall brand impression (Parasuraman et al., 1985). The quality of products, such as gasoline grades and additives, also influences consumer views and brand loyalty. Westbrook (1987) states that perceived product quality influences consumer happiness and willingness to repurchase (Junejo et al., 2024). Brand loyalty refers to the emotional rewards or experiences customers gain from a service interaction (Verhoef et al., 2009). Extensive research has revealed the impact of customer experience on customer satisfaction and loyalty.

Later, Naik et al. (2010) applied the SERVQUAL model to examine service quality factors in retail environments. Their research revealed that tangibility, dependability, responsiveness, certainty, and empathy significantly influence customer happiness (Muhairat et al., 2024). The study emphasised that closing the gap between customer expectations and actual service experience is essential for increasing customer satisfaction. Staff friendliness, individualised treatment, and a pleasant ambience at gas stations may increase customer satisfaction. In the context of petrol stations, the product-service combination is a critical driver of brand leadership. Combining high-quality products with exceptional service experiences boosts consumer loyalty and adds to a strong brand image. The authors emphasise the necessity of knowing customer perceptions and decision-making processes when selecting gasoline stations, as they directly influence the performance and profitability of these enterprises. They discovered that perceived value is a multidimensional concept encompassing product quality, pricing justice, customer service, convenience, and overall pleasure. These factors play an important role in creating client perception. Research suggests researching techniques to enhance these characteristics and their influence on consumer perception and loyalty,

using the theoretical framework of perceived value. According to Bisht and Rai (2015), the theory of perceived value plays an important role in understanding consumer behaviour and satisfaction.

In highly competitive markets, service differentiation becomes a strategic tool for fuel retailers. Brand reputation influences consumers' choice of fuel stations (Inderadi and Setiadi, 2017). Studies conducted in emerging markets have shown that fuel stations with superior service quality are more likely to retain customers and build strong brand loyalty.

Inderadi and Setiadi (2020) conducted a literature study to determine the elements influencing consumers' preferences when choosing a petrol station, focusing on Petronas stations in Ayer Keroh, Malaysia. The authors sought to explore the fundamental characteristics influencing customer decision making and loyalty to gas stations in this location. Research by Hameed (2020) highlights the significance of service quality in Saudi Arabia's retail petroleum business and provides AHP and QFD as sound decision making and quality improvement methods. This research focuses on the elements of service quality at petrol stations, including customer happiness, convenience, cleanliness, and product quality. It will most likely cover how AHP may prioritise these dimensions and how QFD can translate consumer wants into concrete actions for providing excellent services in a gas station.

Karim et al. (2021) used SERVQUAL, Pearson's correlation, and the gap analysis to study customer perceptions and satisfaction at petrol stations in Malaysia. The results confirmed that customer expectations surpassed their authentic service experience, highlighting the need for targeted improvements in cleanliness, personnel attentiveness, and extra amenities to increase customer satisfaction.

The research by Riseetyawan et al. (2022) explored how service quality and facilities influenced customer satisfaction at petrol stations in Setu Bekasi, West Java. This study revealed that service quality and facilities significantly directly and indirectly impacted customer satisfaction using structural equation modelling-partial least squares (SEM-PLS). Fuel station architecture, personnel conduct, convenience store items, and the safety measures were all important attributes in determining customer happiness. Their study found that the well-maintained facilities. And effective customer service leads to an increase in customer satisfaction and loyalty.

Clean, high-quality gasoline is regarded as an important aspect in achieving peak vehicle performance and customer happiness. Customers evaluate whether the price justifies fuel quality and other station qualities, making fair fuel pricing a significant predictor of perceived value. Customers place a high value on product quality while assessing gasoline stations. Gas station product quality may be evaluated using fuel purity, octane ratings, and the absence of pollutants (Abdul Shukor et al., 2022). According to research, variables such as employee politeness, facility cleanliness, and timeliness in responding to client inquiries all lead to greater levels of service quality in fuel station outlets (Abdul Shukor et al., 2022). As a result, fuel stations that offer exceptional service quality tend to attract and keep consumers.

Another study by Fonna et al. (2022) examines the link between perceived retail service quality, emotional value, image, customer happiness, and customer loyalty at public petrol stations (SPBU) in Banda Aceh City. This literature review seeks to give an overview of the available research on gasoline stations and service quality, which might serve as a platform for future study in this field (Roy and Vasa, 2025).

Research by Kinderis et al. (2023) examines the quality of customer service in Lithuania's gas stations, utilising SERVQUAL and RSQS methodologies. This study examines different areas of customer service, including response time, staff friendliness, and overall satisfaction. The findings imply that there is space for improvement in the quality of customer service (restroom hygiene, staff interaction) at Lithuanian gas stations. The research recommends that the gas station network increase customer service and overall satisfaction. Overall, the paper emphasises the necessity of offering exceptional customer service in the gas station market in Lithuania.

These results align with SRVQUAL and marketing mix literature, which confirms that both service quality and marketing practices shape customer satisfaction. This study focuses on one region, and it only relies on the quantitative method and limited exploration of demographic influence, which highlights the opportunities for further research

Nathanael et al. (2024) examine service quality using gap analysis and importance-performance analysis at government-owned fuel stations in Indonesia. This research finds that service quality attributes like staff efficacy, cleanliness, and convenience store availability require more improvements. So, this study suggests that enhancing these factors improves customer satisfaction and competitor positioning.

Pangani and Mwanza (2024) explored customer preferences by identifying service quality, location, brand image, and non-fuel amenities as important attributes in Zambia's fuel retail sector. The research by Pangani and Mwanza (2024) highlighted that customers preferred fuel stations with strong brand reputations and diverse service offerings, including convenience stores and vehicle facilities.

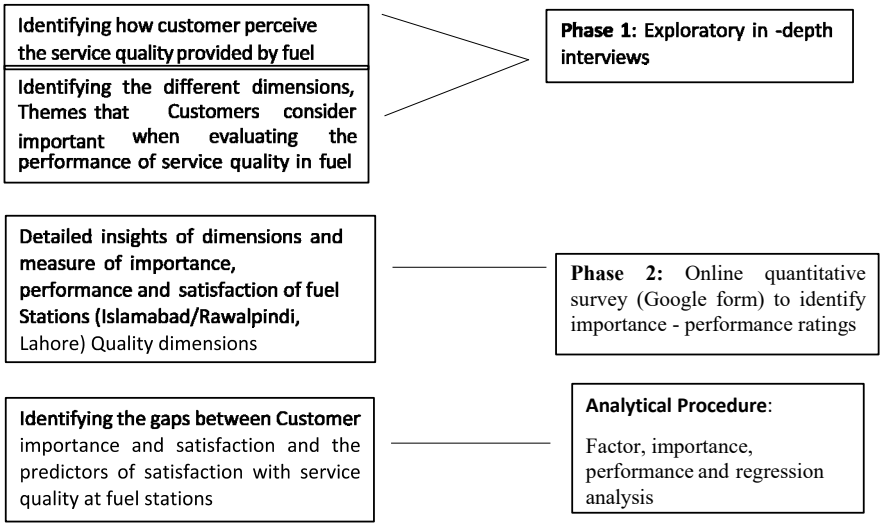
This analysis emphasises the need for greater research into gasoline station service quality, mostly in developing countries. It validates that attributes like cleanliness, staff conduct, price, and brand reputation affect consumer happiness. SERVQUAL and importance-performance analysis (IPA) are the two methodologies that can help discover areas for improvement. Future research should investigate how digital payments, automation, and sustainability might improve service quality and consumer loyalty.

Overall, the literature shows that service quality, product quality, cleanliness, price fairness and brand reputation are important attributes for customer satisfaction and loyalty in filling stations throughout different countries (Parasuraman et al., 1985; Westbrook, 1987; Verhoef et al., 2009; Abdul Shukor et al., 2022; Fonna et al., 2022; Pangani and Mwanza, 2024). While many studies exist on traditional service quality factors but there is limited research on emerging trends like digitalisation, automation and sustainability in fuel retail sector, so by addressing these gaps this research aims observe conventional service quality factors and innovation practices which provides the great understanding of attributes that most influence on customer satisfaction in Pakistan filling stations.

3 Study context and methods

This study aims to investigate customer satisfaction with the service quality of fuel stations by identifying their perception of importance and performance. This study focused on fuel stations in Rawalpindi/Islamabad and Lahore.

Figure 1 Objectives



3.1 Study sites

The petrol stations analysed here are also known by their brand name, like filling stations, gas stations, and fuel stations, which are used alternatively to refer to petrol stations in this study. This study focused on different fuel stations in the following main cities: Islamabad/Rawalpindi and Lahore. Fuel stations Lahore (located in Lahore, the capital of Punjab Province), and fuel stations Islamabad/Rawalpindi (in Islamabad; the federal capital of Pakistan). These highly populated cities are fast growing in their transportation needs because of their high urban population (Lahore 3.23 million, Islamabad/Rawalpindi 2.84 million) (Macrotrends, https://www.macrotrends.net/cities/22046/lahore/population). The prices of petrol are decided by the government. The different fuel stations, current prices, and locations involved in this research are summarised in Table 1.

The different petrol stations from where we collect data for our research is given in Table 2.

Table 1 Participating petrol stations

Parameters	*Fuel stations in Islamabad/Rawalpindi*	*Fuel stations in Lahore*
Location	Islamabad/Rawalpindi	Lahore
Prices (as of 16 November 2023)		
Petrol	$1.008	$1.008
High-speed diesel	$1.06	$1.06
Light speed diesel	$0.647	$0.647
Kerosene oil	$0.735	$0.735

Table 2 Area wise fuel stations

Name	*Address (Islamabad/Rawalpindi)*	*Lahore*
Shell petrol pump	Sarwar Road (which is known as Panjsarki)	Multan Road, 53780, Lahore, PK
	Near Khawaja Corporation, Adyalllah Road	
PSO gas station	GT, Rawat	Raivand Road
PSO gas station	Near Kacahri Chowk	
Ghani PSO petrol pump	G.T. Road	
Attock petrol pump	Near Kachari Chowk	
Total Parco petrol pump	Misrial Road	Lahore Rd, Sheikhupura
	Rawal Road	

3.1.1 Phase 1: exploratory interviews

We employed qualitative research to gain insights into the factors that fuel station stakeholders, including customers, policymakers, academics, and transportation experts, consider in various dimensions of fuel station service quality. In phase 1, we conducted 25 face-to-face self-interviews until the thematic saturation point was reached, meaning that additional interviews stopped producing new information and respondent answers became repetitive. In these interviews, both males and females participated, and the age was mostly between 20–40 years. Most of them are working people and regular fuel station customers. A total of 18 fuel stations' service quality attributes, factors were retrieved from these in-depth interview analyses through N-vivo, and are shown in Table 3.

Table 3 Service quality attributes

Attributes		*Define*
1	Quality of petrol	Denotes the petrol's octane level and purity, which ensures current engine performance and less car damage.
2	Visibility and accessibility of fuel stations	The efficiency and availability of engine oil replacement services in preserving vehicle health.
3	Vehicle lanes	To assurance safe and effective vehicle movement, lanes should be well-organised, smooth, and clear of obstructions.
4	Mosques	Customers can fulfil their religious obligations in the designated prayer space at the gas station.
5	Separate mosques	Separate prayer areas based on gender to preserve comfort and privacy
6	Washroom cleanliness	Separate, clean, and accessible facilities for men and women to meet the basic hygiene needs..
7	Tyre shop services	Tyre repair and replacement services are available for both vehicle safety and customer convenience.
8	Car wash facilities	Provide cleaning and washing services to preserve the cleanliness and appearance of vehicles.

Table 3 Service quality attributes (continued)

Attributes		*Define*
9	Kids playing area	Children can play in a clean, safe area while their parents are at the station.
10	Proper fuel quantity	Fuel must be allotted accurately to guarantee that consumers receive the exact amount they paid for, avoiding shortages.
11	Card payment facility	The convenience of cashless transactions is offered by the ability to pay with debit/credit cards or mobile wallets.
12	Oil changing services	The effectiveness and accessibility of engine oil change services in preserving vehicle health
13	Safety of customers	Regulations prohibiting smoking and handling flammable items properly are examples of precautions taken to avoid mishaps, fires, or other dangers.
14	First aid	Basic medical supplies and emergency support are available at the station.
15	Staff behaviour	The customer service, courtesy, and professionalism of fuel station staff.
16	Complaint offices	Fuel station complaint offices are places where patrons may readily report problems, provide comments, and seek prompt resolution of their complaints.
17	Working women's	hiring female employees to support gender equality and offer services like customer service or cashiering

3.1.2 Phase 2: self-administered online survey

In the second phase of this research, a self-administered online survey was used to collect quantitative data from fuel station customers. The survey instrument is based on a Google form, with a 5-point scale consisting of 46 questions, with two measuring general information, six measuring demographic information, and 32 measuring both the importance and performance of service quality attributes identified in phase 1. All attributes are listed and coded in the Appendix.

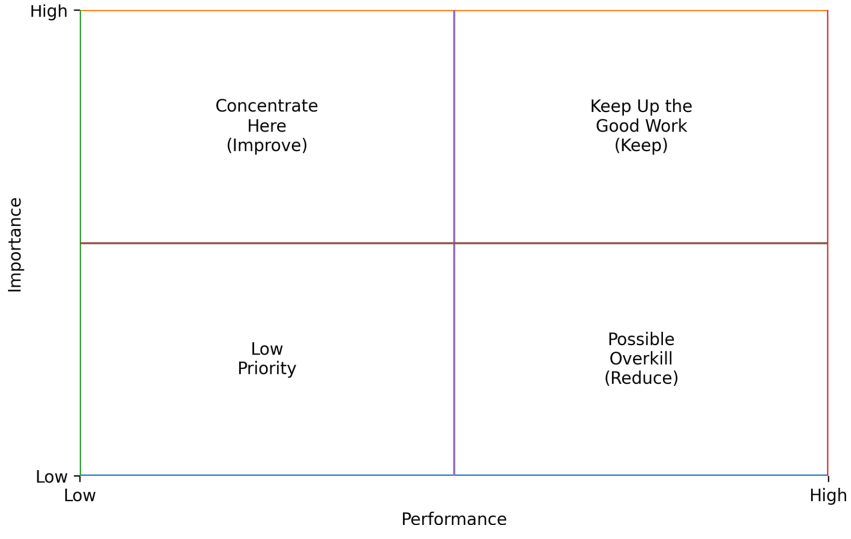
The survey was distributed by using convenience sampling, which introduces the self-selection bias. A Google Form was used to send the respondents through WhatsApp with a link, asking them to complete and finish the survey. Access to the Google form outlining the specifics of the study was made possible by clicking on the link, after which informed consent was required. Those who agreed to participate were screened by asking if they had visited any fuel stations in Islamabad/Rawalpindi and Lahore. The survey questions were then made available to those who were judged to be eligible. A total of 250 respondents gave their responses, but from 250, only 232 responses were given authentic responses, and the remaining responses showed that they had not visited fuel stations. The respondents from Lahore were 100, and from Islamabad/Rawalpindi, the respondents were 132. The period of data collection was October 2023 to December 2023.

3.2 Importance performance analysis

An important performance analysis (IPA) evaluates how well expectations and perceptions match up in various areas, like customer satisfaction, hospitality, education industries, etc. It involves contrasting the significance of characteristics or indicators with their output or availability. Typically, a Cartesian diagram is used for the analysis, with the qualities shown according to their performance levels and importance. The analysis's findings can be used to prioritise or identify areas that need improvement. Studies on customer satisfaction with government services have used IPA (Wisudawati et al., 2023). One of the main features of IPA is that it collects explicit pleasure data and compares it with ratings of perceived significance to yield valuable information for enhancing high-importance-low performance. To enhance the results and provide deeper insights, it has been suggested that IPA is best utilised with related approaches like gap and regression analysis (Greenland et al., 2021).

The IPA technique uses a four-quadrant matrix to present the importance and performance of service quality attributes, which is shown in Figure 2.

Figure 2 Four-quadrant matrix (see online version for colours)



In quadrant 1, 'keep up the good work' (high performance-high importance) means that these attributes have too much importance, and their performance is also good, which helps to gain a competitive advantage. Attributes in quadrant 11 represent 'focus here' (high importance-low-low performance), which means these attributes have too much importance, but their performance on these is very low, so there is a high and immediate need to focus on these attributes to increase customer satisfaction (Martilla and James, 1977). In quadrant 3, 'low priority' (low importance-low-low performance) shows that these service quality attributes do not have much importance, and their performance is also low, so it indicates that there is no need to focus or invest more in these attributes because they do not much importance. Quadrant 4 represents 'possible over skill' (low importance-high performance), which means service quality attributes use more resources, but there is not much strategic importance; their importance is low. In this

four-quadrant matrix, the performance ratings, which represent satisfaction, are taken on the y-axis, and the importance of ratings, which represent the importance of customers towards the attributes, are taken on the x-axis.

4 Results

This study used two primary statistical methods, Statistical Package for the Social Sciences (SPSS) and Smart PLS, to understand and analyse data.

- Exploratory factor analysis (EFA): it simplifies fuel station service quality by combining comparable components for easy analysis.
- Confirmatory factor analysis (CFA): this approach used Smart PLS and attempted to confirm and validate the connections between the grouped items from the previous analysis.
- Importance-performance analysis (IPA): this analysis determined how essential specific features were to customers and how well they were implemented in the service. These parameters revealed insights about explicit client satisfaction.
- Regression analysis: this approach was used to determine how well the resulting customer satisfaction scores predicted or explained total satisfaction using the identified components.

The results of these analyses are explained and summarised in the subsequent sections of the study, providing insights into customer satisfaction with the fuel stations' service.

4.1 Respondent profile

In Table 4, according to 232 authentic responses, 106 males (45.7%) and 126 females (54.3%). The most excellent age group is 20–30 years (53.4%), while the lowest is over 50 years (4.7%). The highest income level is above 45,000 (42.2%), while the lowest is 36,000–45,000 (9.1%). Almost 46.1% of respondents were married, while 53.9% were unmarried; nevertheless, when combined with job information, it was discovered that only 68.5% worked full-time, 23.7% were employed part-time, and the remaining 7.8% were unemployed. 47.0% have a public organisation, 10.8% have a semi-public one, and 42.2% have a private one. These characteristics represent the data from the respondents who participated in this survey.

4.2 EFA and construct reliability

In Table 5, the varimax rotation used in EFA was conducted to assess the reliability and validity of fuel service quality attributes, which were identified. EFA helps reduce the dimension to a controllable number of inter-item correlations and helps delete the items with insufficient factor loadings (Field, 2024), eigenvalues greater than 1 and factor loadings exceeding 0.5. A total of 15 items were retained under the following four factors: tangible (six attributes), reliability (four attributes), assurance (two attributes) and empathy (three attributes). The factor analysis model shows a significant Bartlett's test ($p < 0.01$) and an acceptable measure of sampling adequacy (KMO = 0.848). The four

factors had satisfactory internal reliability (tangible: $\alpha = 0.754$, CR = 0.826; reliability: $\alpha = 0.726$, CR = 0.782; assurance: $\alpha = 0.721$, CR = 0.822), empathy: $\alpha = 0.711$, CR = 0.763, and adequate convergent validity (AVEs: tangibility = 0.521; reliability = 0.511, assurance = 0.701, and empathy = 0.518) (Fornell and Larcker, 1981). Multicollinearity and common method bias were checked by using the VIF method. All four factors have VIf < 3.3, which was acceptable, indicating that there is no multicollinearity and CMB. Some attributes from these four dimensions were removed because of low factor loadings. Further EFA findings are shown in Table 3.

Table 4 Respondent profile

Demographic variable	*Category*	*Frequency*	*Percentage*
Gender	Male	106	45.7
	Female	126	54.3
Age	Less than 20	16	6.9
	20–30	124	53.4
	30–40	32	13.8
	40–50	49	21.1
	Above 50	11	4.7
Income level	Less than 15,000	30	12.9
	15,000–25,000	38	16.4
	26,000–35,000	45	19.4
	36,000–45,000	21	9.1
	Above 45,000	98	42.2
Marital status	Married	107	46.1
	Unmarried	125	53.9
Employment status	Employed full-time	159	68.5
	Employed part-time	55	23.7
	Unemployed	18	7.8
Organisation type	Public	109	47.0
	Semi-public	25	10.8
	Private	98	42.2

Note: n = 250.

4.3 IPA and gap analysis

Table 6 shows the IPA mean ratings of fuel station attributes with the gaps between importance and performance ratings. The gap analysis in this table highlights which service quality attributes have high IPA gaps and need to be focused on more. According to the results shown in the table, the meaning for the importance rating ranges from high 4.49 to low 2.46, and the meaning for the performance rating ranges from high 3.63 to low 2.40. The highest importance rating was the ‘safety of customers’, which is (m = 4.49) and the lowest importance rating was ‘kids playing area’, which is (m = 2.46) whereas for performance the highest rating was ‘car wash facilities’, which is (m = 3.63) and the lowest rating was ‘fair prices in tuck shops’ which is (m = 2.400).

Table 5 EFA results

Dimensions		*Items*	*Factor loadings*	*AVE*	*A*	*CR*	*VIF*
Tangibility	1	Visibility	0.596	0.521	0.754	0.826	1.44
	2	Accessibility	0.707				
	3	Mosques	0.685				
	4	Separate mosques for males and females	0.600				
	5	Washroom cleanliness					
	6	Tyre shops	0.696				
	7	Car wash	0.700				
Reliability	1	Quality of petrol	0.609	0.511	0.726	0.782	1.60
	2	Proper fuel quantity	0.601				
	3	Card payment facility	0.802				
	4	Oil changing services	0.728				
Assurance	1	Safety of customers	0.938	0.701	0.721	0.822	1.35
	2	First aid facility	0.722				
Empathy	1	Staff behaviour	0.716	0.518	0.711	0.763	1.25
	2	Complaint offices	0.678				
	3	Working women	0.762				
(KMO) measure of sampling adequacy			0.848				
Bartlett's test of sphericity			0.000				

The gap analysis shows that the highest gap between importance and performance analysis existed for 'washroom cleanliness' which is (m = 1.82) and after this first aid (m = 1.75), the fair price in tuck shops (m = 1.57), safety of customers (m = 1.56), complaint offices (m = 1.46), vehicle lanes (m = 1.39), proper fuel quantity (m = 1.25), 'quality of petrol (m = 0.93), cards payment facility (m = 0.77), mosques (m = 1.76), separate mosques (m = 0.61), staff behaviour (m = 0.59), tyre shop facilities (m = 0.55), visibility and accessibility of fuel stations (m = 0.54), oil changing services (m = 0.38), working women (m = 0.254), car wash facilities (m = 0.253), restrooms (m = 0.07), and for 'kids playing area' the performance rating exceeding form the importance rating (m = –0.03).

4.4 IPA grid analysis

The mean scores are used in the IPA grid for both importance and performance for each fuel station service quality attribute from the collective data to identify which areas need attention. The mean score of each important attribute is plotted on the y-axis, which is represented by a grey line, and the mean score of each performance attribute is plotted on the X-axis, which is represented by the red line, and both lines intersect. Based in these

IPA mean scores, in quadrant 1(keep up the good work), quality of petrol, proper quantity of petrol, tyre shops, car wash facilities, staff behaviour, mosques, separate mosques for male and females, oil changing services, visibility and accessibility of fuel stations, working women's, complaint offices, safety of customers, card payment facility, rest rooms and vehicle lanes (high performance-high importance) means that these attributes have too much importance and their performance is also good and it helps to gain competitive advantage. The attributes 'washroom cleanliness, first aid, fair prices in tuck shops', are placed in quadrant 2 'concentrate here' which indicates that these attributes are rated higher average on importance and lower average on performance means that highly and immediate need to focus on these attributes to increase customer satisfaction. In quadrant 3, 'low priority' (low importance-low performance) shows that these attributes 'kids playing area', do not have much any importance and their performance is also low so it indicates that there is no need to be focus or invested more in these attributes. In quadrant 4 'possible to over skill' (low importance-high performance) which means the service quality attribute use more resources but their importance is low. However, according to the survey, no fuel stations are located in quadrant 4, so the resources are not wasted.

Table 6 IPA mean ratings

Attributes	*Overall n = 250* *I(X)*	*P(X)*	*I-P*
Visibility and accessibility of fuel stations	4.056034483	3.50862069	0.547414
Vehicle lanes	4.163793103	2.767241379	1.396552
Mosques	4.211206897	3.448275862	0.762931
Separate mosques	3.806034483	3.193965517	0.612069
Washroom cleanliness	4.297413793	2.474137931	1.823276
Tyre shop services	4.146551724	3.599137931	0.557414
Car wash facilities	3.892241379	3.637931034	0.25431
Kids playing area	2.465517241	2.495689655	–0.03017
Quality of petrol	4.357758621	3.426724138	0.931034
Proper fuel quantity	4.487068966	3.237068966	1.25
Card payment facility	4.202586207	3.439655172	0.772931
Oil changing services	3.853448276	3.465517241	0.387931
Safety of customers	4.49137931	2.913793103	1.567586
Fair prices in tuck shops	3.918103448	2.400862069	1.57241
First aid	4.24137931	2.487068966	1.75431
Staff behaviour	4.172413793	3.577586207	0.594828
Complaint offices	4.077586207	2.607758621	1.469828
Working women's	3.176724138	2.922413793	0.25432

Notes: I(X) – mean of importance ratings; P(X) – mean of performance ratings;
(I-P) – gap between means of IPA ratings.

Figure 3 IPA analysis (see online version for colours)

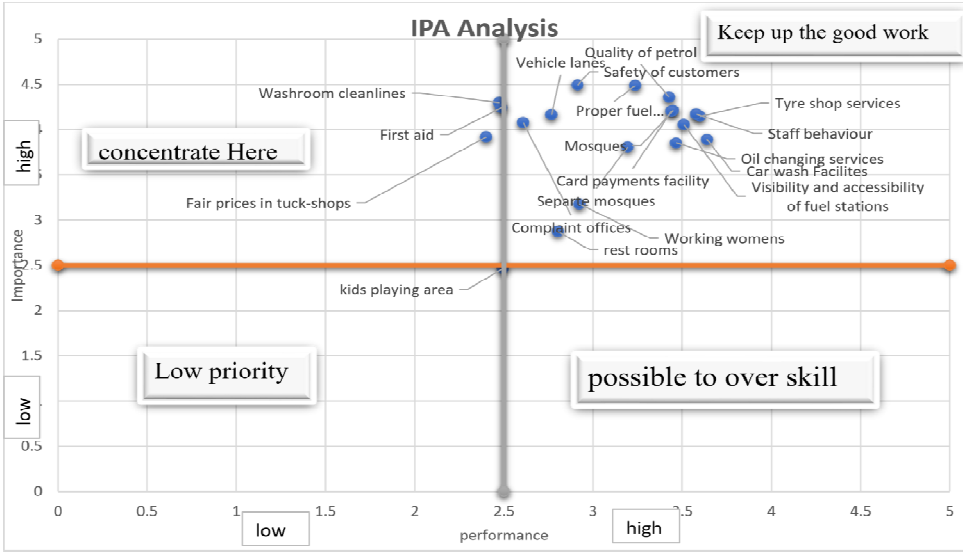
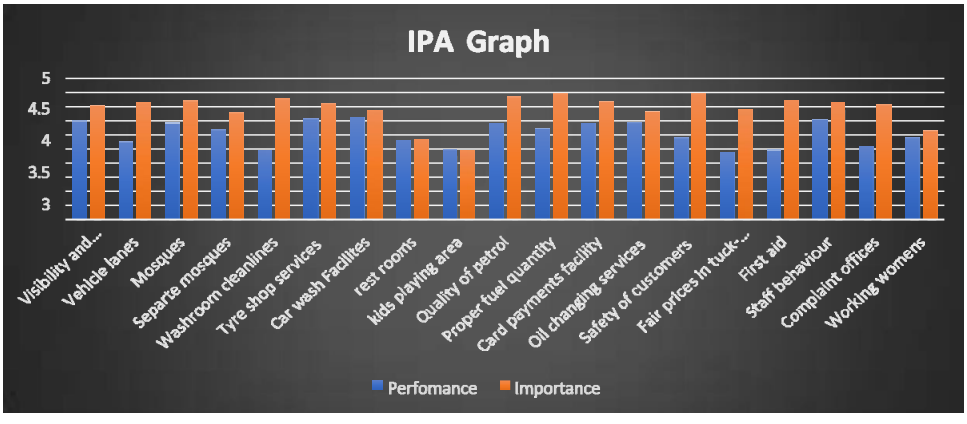


Figure 4 IPA graph (see online version for colours)



4.5 Satisfaction through regression analysis

The satisfaction model generated in this study was used to investigate the links between total customer satisfaction and the four higher-order components of the 15-fuel station service quality aspects (tangibility, dependability, assurance and empathy). The regression model findings are given in the table above. The R^2 value of 0.44 shows that the model explains 44% of the variation in customer satisfaction with the fuel station's service quality features and the adjusted R^2 value 0.39 shows that the predictors how much explained customer satisfaction after removing the effect of unnecessary effects. Overall customer satisfaction is most influenced by reliability ($\beta = 0.$, $p < 0.05$,) with its confidence interval of (0.011 to 0.370), followed by tangibility ($\beta = 0.200$, $p < 0.05$), its confidence interval is 0.071 to 0.380, assurance have ($\beta = 0.174$, $p < 0.05$) and

confidence interval from –0.004 to 0.337, and empathy have ($\beta = 0.116$, $p < 0.005$) with its confidence interval (–0.035 to 0.240). These findings dhows that reliability and tangibility have significant results, assurance have marginal and empathy have insignificant results. According to VIF values which are below 3.3 shows that there is no multicollinearity while histogram shows that data is normal distributed, homosecacidity assumptions were satisfied by the absence of funnel patterns in residual plots. The satisfaction findings indicate the need to focus on assurance and empathy to enhance the quality of service at fuel stations and increase customer happiness.

Table 7 Regression analysis

Predictors	*Estimate (β)*	*t-value*	*p-value*	*Effect size*	*95% CI for b*
Tangibility	0.186	2.20	0.039	0.17	0.011 to 0.370
Reliability	0.232	2.80	0.005	0.24	0.071 to 0.380
Assurance	0.166	1.96	0.055	0.15	–0.004 to 0.337
Empathy	0.097	1.47	0.141	0.11	–0.035 to 0.240

Notes: $R^2 = 0.44$; adjusted $R^2 = 0.39$.

5 Discussion and conclusions

The study's findings give a complete insight into customer service quality perceptions at petrol stations in Islamabad/Rawalpindi and Lahore. Using a mixed-methods approach that included qualitative in-depth interviews and quantitative online surveys, numerous characteristics of service quality were discovered and analysed. By examining fuel stations in three major cities, this research identifies critical areas for improvement to improve consumer satisfaction.

One significant contribution of this study is the utilisation of several research methodologies to measure fuel station service quality. The findings of this research reveal the differences between what customers expect and what they receive, which highlights the need for focused improvements. Previous studies have established that combining research approaches produces a more complete picture of service quality.

The gap analysis conducted in this study discovered that the most significant gap between what customers perceive and what they receive is in 'washroom cleanliness', followed by 'first aid availability' and 'fair pricing in tuck shops'. While the 'restrooms' had the smallest gap. These findings are consistent with global trends, which show that cleanliness and convenience are becoming increasingly important for customer satisfaction. This gap analysis may not exactly reflect desired quality attributes, and the highest gap between importance and performance might not always specify factors that contribute to the overall satisfaction (Greenland et al., 2021).

Exploratory factor analysis (EFA) assisted in determining four major elements of service quality: tangibility, reliability, assurance, and empathy. These parameters comprise a wide variety of variables, including fuel quality, facility cleanliness, and personnel demeanour. In regression analysis, reliability is the most important factor in overall customer satisfaction, so the discovered dimensions have excellent reliability and validity, indicating that the analysis is robust.

Table 8 Comparison of gap, IPA and regression analysis outcomes

Explicit importance ranking	*Gap analysis ranking*	*IPA grid 'concentrate here'*	*Statistically significant drivers of satisfaction*
Safety of customers	Washroom cleanliness	Washroom cleanliness	Reliability
Proper fuel quantity	First aid	Fair prices in tuck shops	Tangibility
Quality of petrol	Safety of customers	First aid	Assurance
Washroom cleanliness	Fair prices in tuck shops		Empathy
First aid	Complaint offices		
Mosques	Vehicle lanes		
Card payment facility	Proper fuel quantity		
Staff behaviour	Quality of petrol		
Vehicle lanes	Card payments facility		
Tyre shop services	Mosques		
Complaint offices	Separate mosques		
Visibility/accessibility	Staff behaviour		
Fair prices in tuck-shops	Tyre shop services		
Car wash facilities	Visibility/accessibility		
Oil changing services	Oil changing services		
Separate mosques	Car wash facilities		
Working women's	Working women's		
Kids playing area	Kids playing area		

Note: Rankings and IPA shows that which service quality elements most influence on customer satisfaction, diagrammed SERVQUAL dimensions are reliability, tangibility, assurance, empathy.

Importance-performance analysis (IPA) was used to further investigate the data and determine the importance of each service quality parameter and its associated performance level. So, this IPA analysis shows that in quadrant 1, which reflects attributes of high importance and performance, comprises essential criteria such as petrol quality, proper quantity of petrol, employee behaviour, car wash facilities, tyre stores, working women, complaint offices, and so on. Numerous studies have demonstrated that, even when other aspects of service quality are excellent, staff attitudes toward customers may increase the overall quality of the visit (Mahmoudi et al., 2012). These characteristics are critical to consumer satisfaction, and the performance should be maintained to achieve a competitive advantage in the market (keep up). Quadrant 2 identified areas of high importance but low performance, indicating a need for rapid attention and improvement. This quadrant includes attributes such as washroom cleanliness, first aid facilities, and tuck shop prices, stressing the significance of resolving these weaknesses to improve overall customer satisfaction levels. So these attributes should be addressed first (concentrate here). Quadrant 3 features low relevance and performance traits; resources should not be heavily directed to these areas. Include facilities such as children's play spaces (low priority). In quadrant 4, there are no housed qualities of low relevance but great performance of gasoline stations, indicating that there is no need to maintain efficient management because there is no attribute with low

priority for consumers. This approach makes sure that the managers can make efforts to maximise customer satisfaction and operational efficiency.

This work contributes to the current body of knowledge in various ways by extending theoretical contributions and the broader service quality literature. First, it researched how fuel stations' consumers perceive their degree of service excellence and developed a theoretical SERVQUAL, which serves as the foundation for the fuel stations' service quality systems (Parasuraman et al., 1988). Secondly, the multi-factor model of fuel station service quality characteristics is presented, which emphasises how it varies from other service settings. By providing a baseline model of fuel station consumer happiness, the structural model highlights the importance of each service quality aspect that drives the customer satisfaction framework. The role of reliability in overall satisfaction aligns with the service encounter theory. These study findings extend the existing models by showing that in emerging economies fuel stations sector, performance-based and physical factors are more effective than the traditional expectation-perception differences. Third, this study compares gap, IPA, and regression (derived satisfaction) analysis to explain methodological variations in estimating the relevance of service quality aspects that contribute to satisfaction.

Table 8 represents the explicit priority rating that represents consumers' perceived importance of service quality traits. However, the gap analysis highlights areas where there are significant disparities between customers' expectations and actual experiences. Notably, attributes such as customer safety, petrol quality, proper fuel quantity, washroom cleanliness, and first aid consistently rank high in explicit importance rankings and gap analysis, indicating their critical importance to customers and potential gaps in meeting these expectations. The IPA grid further categorises traits depending on their relevance and performance levels, with those in the 'concentrate here' quadrant indicating areas that require immediate attention for development. Attributes such as restroom cleanliness, first aid, and fair prices in tuck stores appear significantly in both the 'concentrate here' quadrant of the IPA grid and rank high in gap analysis, highlighting their importance in increasing customer satisfaction. Furthermore, a comparison of attributes identified in the 'concentrate here' quadrant of the IPA grid and statistically significant satisfaction drivers from regression analysis reveals overlap, emphasising the importance of addressing these attributes to improve overall customer satisfaction.

According to regression analysis, the most important predictors of total customer satisfaction were tangibility and reliability, followed by assurance and empathy. This demonstrates the value of items like gasoline, goodwill, and dependable services in fostering consumer understanding and trust. Furthermore, establishing dependability and transparency in delivery may boost customer satisfaction and foster long-term trust. It gives good access to stations between Islamabad, Rawalpindi and Lahore.

This research provides advice to gasoline stations on how to improve customer happiness and trust by assessing the significance of service quality and analysing its importance and performance level. Prioritise upgrading and changing services to satisfy consumer demands. Fuel stations may boost their competitive position in the business sector by concentrating on enhancing service quality in all areas, including tangibility, reliability, recognition, and comprehension. The importance of delivering excellent service to clients at gas stations. By addressing areas of improvement and concentrating on offering excellent service, gasoline stations may establish connections with

consumers, boost their reputation, and increase company performance in the competitive industry.

6 Implications, limitations and future directions

This research gives clear guidance to the managers about service quality improvements which directly effect the customer satisfaction. In IPA grid attributes in the section concentrate here (washroom cleanliness, first aid, fair pricing tuck shops) needs to be immediate attention as they show high importance but low performance. Focusing on these areas however maintaining the high performance and high importance attributes like (fuel quality, fuel quantity, and employee behaviour) makes sure that the resources are allocated efficiently and the customer satisfaction is maximised.

Also, improving service quality in fuel stations supports green innovation. Clean and well-maintained washrooms and facilities reflect better waste management, while the good fuel quality and accurate dispensing reduce the leakage and protect from environmental hazards. This study shows the high importance of staff behaviour, which suggests providing better training to staff about environmental safety practices and the use of green technologies. According to the study, fuel stations have high reliability and also perform well in tangibility, which supports adopting green innovations like solar-powered lighting, proper chemical disposal systems, and eco-friendly infrastructure. Overall, this comprehensive research provides significant information for gasoline station owners and regulators to select areas for change that correspond with customer expectations and generate increased satisfaction. Therefore, by improving service quality dimensions, not only enhance customer satisfaction but also support engagement toward eco-friendly, sustainable green practices.

As with many of the studies, this research has certain limitations that need to be addressed. Firstly, this study is geographically limited to Islamabad/Rawalpindi and Lahore, which may not completely represent the diversity of fuel stations in different regions throughout Pakistan. The unique characteristics and the preferences of customers are different in these urban cities from those in rural and smaller areas, which is confirmed by the findings. Future studies should expand the geographical scope, which provides a more comprehensive analysis.

Secondly, the data was collected through self-administered surveys, which depended on the respondents' self-reported perceptions. This research method risks creating biases. Because respondents could show socially desirable responses or experience exhaustion in replying, leading to potential inaccuracies in the results. Several ways to treat social desirability bias have been identified in the literature. Grimm (2010) might be used in future studies. Also, future studies use different alternative techniques, like observational studies and structured interviews, to mitigate these biases.

Thirdly, this research finds key quality service attributes that influence customer satisfaction. However, it does not consider the impact of emerging technology on service experiences like digital payment systems, automation, eco-friendly alternative fuels, and their role in shaping customer perceptions. Future studies could examine how technological advances influence customer satisfaction and service expectations.

Fourth, this research uses important performance and regression analysis. These approaches provide valuable insights, but future studies could use other approaches, like focus groups or case studies, to better understand what customers expect and experience.

Also, future studies could conduct longitudinal studies to see how customer opinion changes over a long period and to understand how service improvements have changed over time.

Lastly, Shell, BP, and other famous fuel stations have followed established international standards for washroom cleanliness, pricing, staff training, safety rules, first aid availability, sustainability, and customer convenience rules, all are directly linked with the areas that need to be focused on in Pakistani fuel stations. On the other hand, implementing improvements may be a challenge for the local managers because of limited financial resources and, lack of trained personnel. So to overcome these limitations, filling stations use low-cost solutions like scheduled cleaning checklists, staff training programs, providing digital monitoring and complaint systems, and standardised operating procedures. By implementing these tactics, make sure that the suggested improvements will remain realistic and link with globally recognised service quality standards. By addressing these limitations, researchers will improve their comprehension of fuel station service quality while providing operational strategies to policymakers and industry stakeholders to raise efficiency and customer satisfaction levels.

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Declarations

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Author contribution

Conceptualisation, SDZ., AA., FE., and MBH; methodology, SDZ., FA., FE., and MBH.; software, AA., and BMA.; validation, BMA., FA., and MBH.; formal analysis, SDZ., FE., and AA., investigation, FE., MBH., and BMA.; resources, FE., FA., and MBH.; data curation, MBH., and FA.; writing – original draft, SDZ., AA., and FE.; writing – review and editing, SDZ., FA., BMA., and MBH.; visualisation, BMA., and AA.; project administration, SDZ and FE.; supervision, MBH.; funding acquisition, MBH. All authors have read and agreed to the published version of the manuscript.

Compliance with ethical standards

A disclosure/conflict of interest statement

- None of the authors of this paper have a financial or personal relationship with other people or organisations that could inappropriately influence or bias the paper's content.
- It is to specifically state that 'no competing interests are at stake and there is no conflict of interest' with other people or organisations that could inappropriately influence or bias the paper's content.

Ethical procedure/approval

This manuscript has been prepared according to the generally accepted moral standards of conduct, and the following is being certified/declared true. As a researcher and along with co-authors of the concerned field, the paper has been submitted with full responsibility, following the due ethical procedure, and there is no duplicate publication, fraud, or concerns about animal or human experimentation.

Informed consent

All participants involved in this research obtained their informed consent

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Appendix

Importance and performance of service quality attributes

Code	*Indicate level of importance of attributes*	*1*	*2*	*3*	*4*	*5*
		Tangibility				
IMT1	Visibility and accessibility of fuel stations	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMT2	Mosques	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMT3	Separate mosques for males and females	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMT4	Washroom cleanliness	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMT5	Tyre shop services	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMT6	Car wash facilities	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMT7	Proper maintained vehicle lanes at fuel stations	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMT8	kids playing area when you go for a long travelling	Extremely unimportant	Unimportant	Neutral	Important	Extremely important

Importance and performance of service quality attributes (continued)

Code	*Indicate level of importance of attributes*	*1*	*2*	*3*	*4*	*5*
			Reliability			
IMR1	Quality of petrol	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMR2	Proper fuel quantity	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMR3	Card payment facility	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMR4	Oil changing services	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMR5	Fair prices of items in tuck shops	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
			Assurance			
IMA1	Safety of customers (in terms of smoke or fire)	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IMA2	First aid facility	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
			Empathy			
IME1	Staff behaviour	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IME2	Complaint offices	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
IME3	Working women's	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
Code	*Satisfaction level of customers with fuel stations*	*1*	*2*	*3*	*4*	*5*
			Tangibility			
ST1	Visibility and accessibility of fuel stations	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
ST2	Mosques	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
ST3	Separate mosques for males and females	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
ST4	Washroom cleanliness	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
ST5	Tyre shop services	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
ST6	Car wash facilities	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
ST7	Proper maintained vehicle lanes at fuel stations	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied

Importance and performance of service quality attributes (continued)

Code	*Satisfaction level of customers with fuel stations*	*1*	*2*	*3*	*4*	*5*
ST8	kids playing area when you go for a long travelling	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
			Reliability			
SR1	Quality of petrol	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SR2	Proper fuel quantity	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SR3	Card payment facility	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SR4	Oil changing services	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SR5	Fair prices of items in tuck shops	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
			Assurance			
SA1	Safety of customers (in terms of smoke or fire)	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SA2	First aid facility	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
			Assurance			
SA1	Safety of customers (in terms of smoke or fire)	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SA2	First aid facility	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
			Empathy			
SE1	Staff behaviour	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SE2	Complaint offices	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied
SE3	Working women’s	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied