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DETERMINANTS OF PERCEIVED SERVICE QUALITY IN URBAN PUBLIC TRANSPORT IN EMERGING ECONOMIES

Summary. This article examines the main factors influencing user satisfaction with urban public transport, based on the case of the ALSA network in Greater Agadir (Morocco). A questionnaire survey conducted among 205 users was analyzed using a two-step statistical approach: Principal Component Analysis (PCA) was first employed to identify the dimensions of perceived service quality, followed by multiple linear regression to assess their impact on overall satisfaction. The results highlight three major determinants: service reliability, travel time, and cost. These findings emphasize the importance of improving service regularity and adapting fare policies in order to enhance equity and the overall quality of urban transport. The study therefore provides an empirical framework that can support decision-making and may be applicable to other emerging urban contexts.

Keywords: perceived quality, urban public transport, principal component analysis, multiple linear regression

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1. INTRODUCTION

Public transport plays a central role in the life of contemporary cities. Providing high-quality services that truly meet user expectations is no longer merely a technical or financial challenge; it is a strategic issue for public authorities [20]. Large urban areas face familiar problems: road congestion, air pollution, parking shortages, and ever-increasing mobility costs. In this context, prioritizing the development of public transport and making it more attractive appears to be an essential lever to reduce urban congestion and promote a sustainable city model [22]. Reducing reliance on private cars and encouraging collective modes of transport is a key condition for sustainably improving urban quality of life.

This issue becomes particularly salient when considering environmental impacts. A large portion of environmental challenges stems from our dependence on fossil fuels, which is especially critical in the transport sector. Despite numerous initiatives to reduce pollutant emissions, this dependence remains a major challenge for cities and their inhabitants [13].

Encouraging citizens to adopt public transport goes beyond simply increasing supply. Services must be reliable, comfortable, and accessible to retain users and attract new passengers [33]. Public transport, often presented as a cornerstone of the transition to more sustainable cities, must also address social and economic challenges to remain inclusive and equitable [19,31].

To enhance their attractiveness, networks must act on several fronts: frequency, coverage, comfort, safety, and value for money. Many cities worldwide invest in these aspects to improve user satisfaction and increase the modal share of public transport [27].

Beyond its mobility function, public transport promotes individual autonomy, particularly for those without alternatives, and contributes to more equitable mobility while limiting environmental impact. By facilitating access to employment, services, and social activities, it directly contributes to citizens' well-being and social cohesion [38, 39].

Service quality and user satisfaction are therefore at the heart of mobility strategies [1]. Evaluating these aspects helps identify what works, what needs improvement, and guides investment and operational decisions by transport operators [16, 30]. A positive perception of services can encourage a shift away from private cars and support the transition to more sustainable mobility [18].

In emerging countries, urban public transport plays a central role in daily mobility, congestion reduction, and the promotion of sustainable transport. Perceived service quality is a key factor for user acceptance and regular usage. However, in the absence of user-centered studies, understanding the factors that influence this quality remains limited.

In this context, the present research focuses on the Greater Agadir metropolitan area in Morocco, where public transport is primarily provided by the urban operator ALSA. To date, no study has explored the determinants of user perceptions regarding the ALSA bus service. This research aims to fill this gap by identifying the main factors influencing perceived quality and providing concrete recommendations to improve services and encourage regular use of public transport.

The study is conducted in three stages: first, a literature review identifies the key factors influencing perceived quality in various urban contexts; next, the methodology is presented, including data collection and analysis from users; finally, the analysis and discussion of results allow for operational recommendations to be formulated for urban transport stakeholders, aiming to optimize satisfaction and the use of public transport in Greater Agadir, Morocco.

2. LITERATURE REVIEW AND HYPOTHESIS

Urban transport systems have historically played a central role in shaping economic development, spatial organization, and social dynamics within cities. Rapid urbanization and population growth have intensified congestion, environmental degradation, and spatial inequalities, challenging the sustainability and livability of urban environments [3]. In this context, public transport is increasingly recognized as a key instrument for promoting sustainable urban mobility by reducing car dependency, mitigating greenhouse gas emissions, and improving accessibility and quality of life [36, 40].

Despite its strategic importance, research on public transport service quality remains unevenly distributed geographically, with limited empirical evidence from Global South cities [26]. Recent studies emphasize the need for user-centered approaches, highlighting perceived quality as a critical determinant of satisfaction, modal choice, and long-term transport sustainability [43]. Policies primarily oriented toward private car use have proven ineffective in addressing congestion and environmental challenges, reinforcing the importance of improving collective transport systems [41].

Existing empirical research identifies several recurring determinants of perceived service quality. Large-scale reviews and case studies consistently highlight reliability, travel time, cost, safety, comfort, accessibility, and service frequency as key factors influencing user satisfaction [24, 42]. Reliability and punctuality emerge as particularly influential across diverse contexts, while travel time and affordability strongly shape perceived value and modal preference [21]. Studies also demonstrate that contextual factors such as neighborhood characteristics, time of travel, and socio-demographic profiles influence user expectations and satisfaction levels [17, 45].

Comparative analyses reveal local variations in priorities, although punctuality and frequency remain universally critical attributes [10]. Research conducted in both formal and informal transport systems further indicates that accessibility, safety conditions, information availability, and infrastructure quality significantly affect perceived service performance [35, 9]. Inclusive mobility studies additionally underline the importance of accessibility and information systems for vulnerable user groups [32].

Overall, despite methodological differences including factor analysis, structural equation modeling, and spatio-temporal approaches, the literature converges on a common conclusion: perceived service quality plays a decisive role in shaping user satisfaction and influencing mobility behavior.

Based on this review, the following research hypotheses are formulated:

H.1 Proximity to transport stops positively influences perceived service quality.
H.2 Transport cost negatively affects perceived quality.
H.3 Service frequency positively influences perceived quality.
H.4 Total travel time negatively affects perceived quality.
H.5 Service reliability positively influences perceived quality.
H.6 Travel comfort positively affects perceived quality.
H.7 Perceived safety positively influences perceived quality.

3. METHODOLOGY

3.1 Target population and sampling strategy

The objective of this study is to identify the key determinants of perceived quality in urban public transport and to measure their impact on user satisfaction, focusing on the Greater Agadir area in Morocco, which is representative of dynamics typical of developing cities.

Greater Agadir is a strategic tourism and economic hub, characterized by rapid urbanization and sustained population growth. These dynamics place increasing pressure on transport infrastructure and pose a major challenge for urban mobility. In this context, public transport constitutes an essential public good, ensuring accessibility and territorial cohesion. The bus network, primarily operated by ALSA, plays a central role in the daily mobility of residents. The choice of this study area is justified by its representativeness of the mobility and public transport challenges faced by emerging cities, allowing conclusions applicable to similar contexts.

The study sample comprises 205 individuals, all regular users of the bus network. In the absence of complete and reliable secondary data, data were collected through a structured questionnaire administered directly in the field, onboard buses and at major stops. Each quality dimension was measured on a five-point Likert scale (1 = very low, 5 = very high), allowing precise quantification of perceptions and systematic comparison across different dimensions.

Given the absence of an exhaustive sampling frame, a convenience sampling method was adopted. This approach, commonly used in social sciences when probabilistic sampling is difficult, involved distributing observations across multiple time slots, different days of the week, and various areas of the network. This strategy allowed for reasonable heterogeneity in terms of sociodemographic characteristics (age, gender) and mobility behaviors (trip frequency and purpose), while limiting selection bias and enhancing the relative representativeness of the sample.

3.2 Estimation Methods

Data analysis was conducted in two stages. First, Principal Component Analysis (PCA) was employed to reduce the dimensionality of the dataset while identifying latent variables that explain most of the observed variance [8, 12, 14, 23]. The adequacy of PCA was verified using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity, ensuring the statistical validity of the analysis [25, 47].

Subsequently, multiple linear regression was applied to examine the effect of each factor on users' perceived quality. This approach allows quantification of the relative influence of each variable and identification of the primary determinants of satisfaction. All analyses were performed using SPSS 26, widely recognized for its reliability in estimating econometric models in social sciences. This methodological approach ensures robust, interpretable, and actionable results, providing a solid foundation for practical recommendations.

3.3 Selection and Justification of Explanatory Variables

The choice of explanatory variables is based both on theoretical foundations related to perceived quality in public transport and on the specific characteristics observed in the Greater Agadir context. The survey conducted with 205 bus users captured individual assessments of

service quality using a five-point Likert scale to reflect the diversity of perceptions and experiences.

Perceived quality is considered a multidimensional concept encompassing both tangible aspects (travel time, physical accessibility, comfort) and intangible aspects (reliability, safety, service perception). These dimensions interact complementarily in shaping overall user judgments and influence satisfaction and public transport usage.

Accordingly, the explanatory variables included in the model reflect the main components of service that structure the traveler experience: accessibility, operational performance, fare equity, travel comfort, and travel safety. Each of these elements is documented in the literature as being critical for evaluating public transport service quality.

To account for user heterogeneity and adjust estimated effects, control variables such as age, gender, employment status, and usage frequency were included. Their inclusion allows for neutralization of individual differences and enhances the robustness of the results.

The empirical model is specified as follows:

$$Perceived\ Quality_i = \beta_0 + \beta_1 Proximity_i + \beta_2 Travel\ Time_i + \beta_3 Frequency_i + \beta_4 Cost_i + \beta_5 Reliability_i + \beta_6 Comfort_i + \beta_7 Safety_i + \varepsilon_i \quad (1)$$

Where:

β_0 : model constant,

$\beta_1 - \beta_7$: coefficients representing the marginal effect of each variable on perceived quality,

ε_i : error term capturing unexplained variance.

Tab. 1

Public Transport Perceived Quality Indicators

Variable	Description
Dependent Variable	
Perceived Quality	Quality can be defined as the ability of a product or service to fulfill its intended use by fully satisfying the purpose for which it is designed [15].
Independent Variables	
Proximity	Usually defined as the distance or walking time from a departure point to the nearest transport stop, with 400 meters considered good accessibility [34, 44].
Cost	Represents access equity, considering expenditures on single tickets and subscriptions [29].
Frequency	Number of vehicle passages on a line within a given interval [28].
Travel Time	Total journey duration, including initial walking, waiting, onboard travel, transfers, and final walking [46].
Reliability	Punctuality (adherence to published schedules) and regularity of vehicle intervals [4].
Comfort	Quality of travel experience, including occupancy, temperature, noise, vibration, and cleanliness [37].
Safety	User perception of safety both during travel and at stops [6].

Source: Author's work

4. RESULTS PRESENTATION AND ANALYSIS

4.1 Socio-Demographic Profile of Respondents

The socio-demographic profile of respondents is presented in Table 2.

Tab. 2

Socio-demographic Profile of Respondents

Characteristic	Main Categories	Percentage (%)
Gender	Female	52
	Male	48
Age	18–25 years	56
	26–40 years	31
	41–60 years	10.5
	Others (<18 & >60 years)	2.5
Employment Status	Student	44.5
	Employed	40.5
	Others (self-employed, unemployed, retired, other)	15

Source: Results from SPSS

The socio-demographic characteristics of respondents are summarized in Table 2. The sample is relatively balanced in terms of gender, with a slight predominance of female users (52%). The age distribution reveals a strong representation of young individuals, as 56% of respondents are aged between 18 and 25 years, followed by the 26–40 age group (31%). Older age categories remain marginally represented.

Regarding employment status, students constitute the largest group (44.5%), followed by employed individuals (40.5%), while other categories account for 15% of respondents. This profile indicates that the bus network is primarily used by young and economically active populations, particularly students and workers. Such a structure suggests that public transport in Greater Agadir mainly fulfills daily mobility needs related to education and employment activities, which may influence service expectations, especially concerning travel time reliability and affordability.

4.2 Validation of Data Adequacy for PCA

Prior to conducting Principal Component Analysis (PCA), data adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity (Table 3).

Tab. 3

KMO Index and Bartlett's Test for Sample Adequacy

Test	Value	df	Significance
KMO Index	0.810	-	-
Bartlett's Test of Sphericity	404.387	21	0.000

Source: Result from SPSS

The KMO value (0.810) indicates strong sampling adequacy, exceeding the recommended threshold of 0.70 for factor analysis. Bartlett's test is highly significant, confirming that correlations among variables are sufficient to justify dimensional reduction. These results validate the appropriateness of PCA and support the robustness of subsequent factor extraction.

4.3 Component Extraction and Communalities

Communality values (Table 4) indicate the proportion of variance explained by the extracted components for each variable. All variables present acceptable extraction values, confirming their contribution to the latent structure of perceived quality.

Tab. 4

Initial and Extracted Communalities of Perceived Quality Variables

Variables	Initial	Extraction
Proximity	1.000	0.387
Travel Time	1.000	0.553
Frequency	1.000	0.597
Cost	1.000	0.929
Reliability	1.000	0.646
Comfort	1.000	0.507
Safety	1.000	0.552

Source: Result from SPSS

Cost exhibits the highest communality (0.929), suggesting that economic considerations are strongly captured by the factorial model. Reliability, frequency, and travel time also show substantial explanatory power. Although proximity and comfort display comparatively lower communalities (0.387 and 0.507), their values remain within acceptable limits, supporting their retention to preserve conceptual completeness.

4.4 Total Variance Explained

Eigenvalue analysis (Table 5) indicates that the first two components explain 59.6% of the total variance, which is considered satisfactory for behavioral and perception-based research. Additional components contribute only marginal explanatory gains and would reduce interpretability without significantly improving model performance.

Consequently, a two-component solution is retained, ensuring parsimony while maintaining sufficient explanatory capacity.

Tab. 5

Total Variance Explained for Perceived Quality Components

Total Variance Explained									
Component	Initial Eigenvalues			Extracted Sums of Squared Loadings			Rotated Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,214	45,921	45,921	3,214	45,921	45,921	3,072	43,885	43,885
2	0,958	13,682	59,603	0,958	13,682	59,603	1,100	15,718	59,603

Source: Result from SPSS

4.5 Interpretation of Factor Structure

Varimax rotation was applied to enhance interpretability (Table 6). The rotated matrix reveals a clear two-dimensional structure.

Tab. 6
Rotated Component Matrix of Perceived Quality Dimensions

Variables	Component 1	Component 2
Proximity	0.540	0.309
Travel Time	0.737	0.103
Frequency	0.773	-0.011
Cost	0.067	0.962
Reliability	0.803	0.023
Comfort	0.707	0.083
Safety	0.700	0.248

Source: Result from SPSS

The first component groups variables related to operational and experiential service performance, including reliability, frequency, travel time, comfort, and safety. This dimension reflects operational service quality, capturing users' daily travel experience.

The second component is strongly dominated by cost, highlighting the central role of economic accessibility in shaping perceived quality. Proximity loads moderately on the first component, indicating a secondary but relevant contribution to service evaluation.

This structure confirms that users primarily evaluate public transport through operational performance and affordability dimensions.

4.6 Internal Reliability

Reliability analysis using Cronbach's alpha yields a coefficient of 0.786 (Table 7), indicating good internal consistency according to commonly accepted thresholds (>0.70). The measurement scale therefore, demonstrates satisfactory reliability and supports the use of extracted factors in subsequent regression analysis.

Tab. 7
Reliability Statistics

Cronbach's Alpha	Number of Items
0.786	7

Source: Result from SPSS

4.7 Regression Analysis and Influence of Dimensions

Multiple linear regression was conducted to evaluate the relative influence of service attributes on perceived quality (Table 8).

Tab. 8
Multiple Linear Regression Results

Variables	Standardized Coefficients (β)	t	P-value
Proximity	0.154	2.279	0.024

Travel Time	0.245	3.276	0.001
Frequency	0.070	0.942	0.347
Cost	0.217	3.422	0.001
Reliability	0.186	2.464	0.015
Comfort	0.046	0.660	0.510
Safety	0.070	0.895	0.372

Source: Result from SPSS

The results indicate that travel time (β = 0.245, p = 0.001), cost (β = 0.217, p = 0.001), reliability (β = 0.186, p = 0.015), and proximity (β = 0.154, p = 0.024) exert statistically significant effects. Among these variables, travel time emerges as the strongest predictor, emphasizing the importance of temporal efficiency in user evaluations.

Conversely, frequency, comfort, and safety do not exhibit statistically significant effects. This finding suggests that these attributes may operate as baseline expectations rather than differentiating factors influencing overall perceived quality within the studied context.

Tab. 9

Overall Model Significance

R^2 Change	F Change	Sig. F Change
0.905	268.490	0.000

Source: Result from SPSS

The regression model demonstrates strong explanatory power, accounting for 90.5% of the variance in perceived quality ($R^2 = 0.905$). The overall model is highly significant ($F = 268.490$, $p < 0.001$), confirming the robustness of the estimated relationship between service attributes and perceived quality.

These results highlight that improvements targeting travel time efficiency, fare affordability, service reliability, and accessibility are likely to generate the greatest gains in user satisfaction and perceived service performance.

5. DISCUSSION

The results of our study confirm hypotheses H2, H4, and H5. Principal Component Analysis (PCA) and multiple linear regression revealed that travel time, cost, and reliability are the main determinants of perceived quality in urban public transport in Greater Agadir. Specifically, increases in cost or travel time reduce perceived quality, whereas higher reliability, reflected in punctuality and service regularity, significantly enhances user satisfaction. These findings highlight the importance of economic, temporal, and operational dimensions in the overall evaluation of service quality.

These findings are consistent with previous studies reported in the literature. Reliability has been identified as a key quality factor by several authors [42], while other studies [2, 11] emphasize the importance of travel time in shaping users' perceptions of service quality. Furthermore, prior research [5, 7] recommends improving fare affordability to encourage public transport use, supporting the significant impact of cost observed in our study.

The results suggest that reducing travel time, controlling costs, and improving reliability constitute essential strategic levers for enhancing perceived quality and promoting public transport use. These priorities can guide decision-making by public authorities and transport

operators seeking to increase the attractiveness and operational efficiency of services in Greater Agadir.

This study also provides insights into overall user satisfaction, offering practical evidence to help policymakers focus on the most critical service dimensions. However, several limitations should be acknowledged. The relatively small sample size may limit the generalizability of the findings. Moreover, the study focused exclusively on current public transport users, excluding non-users (such as private car drivers), whose needs and preferences may differ.

Future research could include private car users to assess the potential for modal shifts toward public transport. Additionally, examining secondary factors such as comfort, safety, and service frequency could provide a more comprehensive understanding of overall satisfaction and support more effective strategic improvements.

Overall, these results underscore that targeted interventions addressing travel time, cost, and reliability are likely to have the greatest impact on user satisfaction and urban public transport usage in Greater Agadir.

6. CONCLUSION

This study aimed to identify the factors influencing perceived quality in urban public transport in Greater Agadir, Morocco, and to provide recommendations for improving services and encouraging greater public transport use. Data were collected from 205 users through a questionnaire and analyzed using Principal Component Analysis (PCA) and multiple linear regression.

The results indicate that travel time, cost, and reliability are the primary determinants of perceived service quality. Specifically, longer travel times and higher costs reduce perceived quality, whereas improved reliability significantly enhances user satisfaction. Optimizing these dimensions, therefore, represents a key strategic lever for increasing the attractiveness of public transport and promoting a modal shift from private vehicles, thereby contributing to more sustainable urban mobility.

From a practical perspective, the study provides concrete recommendations for decision-makers and transport operators, including reducing travel times, adjusting fare policies, and strengthening service reliability. The findings also offer a solid empirical basis for the development of integrated mobility policies centered on user needs.

However, several limitations should be acknowledged. The relatively small sample size and the exclusion of non-users limit the generalizability of the results. Future research should include private vehicle users and examine additional dimensions such as comfort, safety, and service frequency to achieve a more comprehensive understanding of perceived quality.

Overall, the study highlights that targeted interventions addressing travel time, cost, and reliability are likely to have the greatest impact on user satisfaction and urban public transport usage in Greater Agadir.

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