

Impact of Service Quality on Suburban Guided Transport Mobility: Case Study of the Electrified Railway Line Alger-El Affroun

تأثير جودة الخدمة على حركة التنقل في الضواحي بواسطة وسائل النقل الموجهة: دراسة حالة خط
السكك الحديدية المكهرب بين الجزائر والعفرون

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ABSTRACT

This research evaluates the quality of railway service in Algeria on the Alger -El Affroun line, a strategic axis for urban and suburban mobility in the capital. The objective is to analyze service quality according to key criteria such as punctuality, safety, and comfort, in order to propose concrete improvements. The developed methodology combines satisfaction surveys and field observations (Renisio & Sinthon, 2014); the statistical tools used include multiple correspondence analysis (MCA) with RStudio for multi criteria analysis (Zheng & Wang, 2022). The results reveal that punctuality is the main factor of dissatisfaction, followed by cleanliness and comfort. Recommendations are formulated, such as the implementation of a centralized intelligent command post to reduce delays, improve passenger information, and optimize comfort. This work highlights the importance of a user centered approach to enhance the reliability and attractiveness of railway transport in Algeria.

Keywords:

Multi criteria analysis; multiple correspondence analysis; Railway transport; service quality; user satisfaction.

ملخص

يقيم هذا البحث جودة خدمة السكك الحديدية في الجزائر على خط «الجزائر - العفرون»، الذي يُعد محورياً استراتيجياً للتنقل داخل العاصمة وضواحيها، كما يهدف البحث إلى تحليل جودة الخدمة المقدمة للمسافرين وفقاً لمعايير أساسية مثل الالتزام بالمواعيد والسلامة والراحة، بهدف الوصول إلى اقتراحات وتحسينات إيجابية. تعتمد المنهجية المستعملة على استطلاعات الرضا لدى المسافرين والملاحظات الميدانية (Renisio & Sinthon, 2014)؛ وتشمل الأدوات الإحصائية المستخدمة تحليل المراسلات (المتناظر) المتعددة (MCA) باستخدام برنامج RStudio بغرض تحليل المعايير المتعددة (Zheng & Wang, 2022). وكشفت النتائج أن الالتزام بالمواعيد هو العامل الرئيسي لعدم الرضا لدى المستعملين، يليه النظافة والراحة. أخيراً تم صياغة عدة توصيات، مثل إنشاء مركز قيادة ذكي مركزي لتقليل التأخيرات وتحسين المعلومات المقدمة للركاب وتحسين الراحة. يسلط هذا العمل الضوء على أهمية اتباع نهج يركز على المستخدم لتعزيز موثوقية وجاذبية النقل بالسكك الحديدية في الجزائر.

الكلمات المفتاحية:

التحليل متعدد المعايير؛ تحليل المراسلات المتعددة؛ النقل بالسكك الحديدية؛ جودة الخدمة النقل؛ رضا المستخدمين

1. INTRODUCTION

Railway transport is an important mode for sustainable development and mobility in Algeria, with a network spanning 4,200 km operated by SNTF and covering more than 30 wilayas (SNTF, 2025; APS, 2025). The Algerian railway system plays a structuring role in the national economy (CNESE, 1998). However, faced with demographic growth and urban expansion, suburban railway lines, particularly Alger El Affroun, are under increasing pressure (Zitouni & Tabti Talamali, 2009). This line, which connects the capital to its southwestern periphery, is essential for the daily mobility of thousands of users; nevertheless, service quality is the subject of numerous concerns, requiring systematic evaluation (Zidani et al., 2024). To reduce traffic difficulties in the Algiers metropolitan area and improve the living conditions of the suburban population, significant investments have been made to develop these railway services and ensure high service quality (Team France Export, 2025).

Research Problem

Rail transport in Algeria, and more specifically the Alger El Affroun line, faces major challenges in terms of service quality (Khaled & Sihem, 2018; Les Enjeux Éco, 2025). This work is structured around two fundamental questions:

- 1. How can the service quality perceived by users of the Alger El Affroun line be objectively assessed ?
- 2. What are the factors behind user dissatisfaction, and how can the attractiveness of this strategic line be improved ?

2. Literature Review

2.1 Concepts of Service Quality in Transport

Service quality in public transport has been the subject of extensive research since the 1980s. According to foundational work (Tuan et al., 2022), service quality is defined as the gap between customer expectations and their perception of the service received. In the railway context, this approach requires adaptation to the specificities of the sector. The widely used SERVQUAL model is based on five key dimensions:

tangibility, reliability, responsiveness, assurance, and empathy. Several studies have adapted this model to the railway context, giving rise to specific instruments such as RAILQUAL (Maruvada & Bellamkonda, 2017; Ntereka et al., 2020).

2.2 Criteria for Evaluating Railway Quality

International research identifies several key dimensions of railway quality. European studies propose a hierarchical model including reliability, punctuality, frequency, capacity, speed, accessibility, safety, comfort, information, and on board services (Shan et al., 2024; Ibrahim et al., 2020). A study conducted on Greek railways the evaluation problem into eight first level criteria: safety, cleanliness, comfort, ticket purchase, information, reliability, and flexibility (Ntereka et al., 2020). These criteria constitute the conceptual basis of our evaluation.

In the context of developing countries, priorities may differ. A study on the Ethiopia Djibouti railway systems revealed that services are effective in five categories of attributes, including reliability, climate control, travel time, information provision, and cleanliness (Dibiku, 2024). Similarly, a study on intercity railway services in Bangladesh identified key factors such as station access, ticketing, and on board services (Khatun et al., 2025).

2.3 Multi Criteria Evaluation Methods

Multi criteria evaluation is particularly suitable for analyzing complex railway systems. The PROMETHEE (Preference Ranking Organisation Method for Enrichment Evaluation) method is widely used in the transport sector (Oubahman & Duleba, 2021). For example, Vilke et al. (2018) used PROMETHEE II to evaluate and select the route of a railway line in Croatia. Similarly, Stoilova (2019) applied a multi criteria approach integrating VIKOR, WASPAS, and PROMETHEE to assess the railway development level of several Balkan countries. A literature review on the PROMETHEE method in the transport sector highlighted its effectiveness for multi criteria decision making (Oubahman & Duleba, 2021).

2.4 Multiple Correspondence Analysis (MCA)

The use of multiple correspondence analysis (MCA) is widespread in studies assessing service quality, particularly when structured questionnaires are developed (Meziani, M, 2018). MCA allows visualization of relationships among several qualitative variables and identification of user profiles. A recent study used factorial correspondence analysis to evaluate public transport service quality and determine user satisfaction (Zidani, O et al., 2024). Another study proposed a quality approach based on multiple correspondence analysis (Meziani, M, 2018).

2.5 Positioning of the Study

This research is distinguished by its methodology combining multiple correspondence analysis and multi criteria analysis, applied specifically to the Algerian context where few similar studies have been conducted (Ghenouchi, 2018; Ait Bara, 2022). The originality of this approach lies in the comparative application of multi criteria methods to distinctly evaluate the performance of each station on the Alger El Affroun line, thus enabling a granular analysis of service quality disparities at the local level.

3. Results and Interpretation

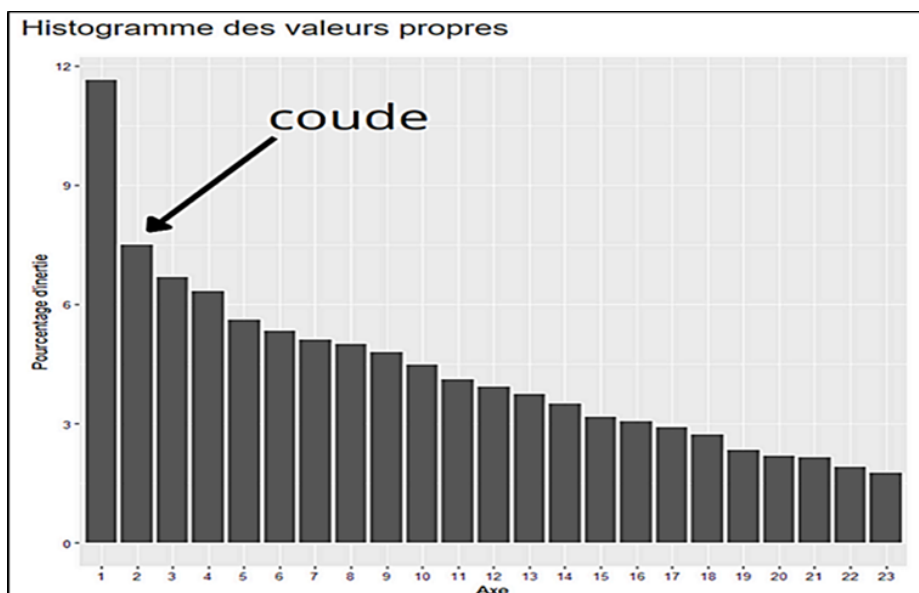
3.1 Descriptive Data Analysis

The passenger satisfaction survey conducted with users of the Alger El Affroun line yielded 298 questionnaires and collected data on six main criteria: punctuality, cleanliness, comfort, safety, passenger information, and staff reception. Preliminary results indicate that punctuality is the most critical criterion, with a majority of users expressing high dissatisfaction. Station and train cleanliness, as well as on board comfort, are also pointed out as priority areas for improvement.

3.2 Multiple Correspondence Analysis (MCA)

MCA was applied to data from 58 modalities collected from users. The number of factorial axes to retain was determined using the empirical elbow criterion.

Fig. 1: Histogram of eigenvalues for Alger-El Affroun



Source: Authors' elaboration using (RStudio)

The eigenvalue histogram reveals a sharp break after the second axis, indicating that only the first two axes are relevant for interpretation. The first axis explains 13.5% of the total inertia, while the second explains 9%. Consequently, two axes were retained for interpretation.

Results

We seek to identify the modalities that contribute most to the construction of each factorial axis. To do this, the average contribution is calculated according to the formula: “**Average contribution** = $1/K \times 100$ ”, where K represents the total number of modalities included in the analysis (Abdi et al., 2013).

Only modalities with a contribution greater than or equal to this average are considered in the interpretation of the axes. In our case, for the Alger El Affroun line, the number of modalities is 58, hence: “Average contribution = $1/58 \times 100 = 1.724\%$ ”. Thus, only modalities with a contribution $\geq 1.724\%$ are considered significant.

Active variables

Axis 1

Table 1: Positive and negative contributions of Axis 1

Variables actives						
Show	100	entries	Search:			
Variable	Level	Coord	Contrib	Cos2	Count	
Q10	Q10_Mauv	2.041	9.80	0.252	17	
Q12	Q12_N	0.832	9.29	0.334	97	
Q11	Q11_Mauv	1.339	8.93	0.246	36	
Q16	Q16_Moy	0.976	8.57	0.266	65	
Q17	Q17_Moy	1.138	6.10	0.167	34	
Q10	Q10_Bon	-0.503	5.12	0.243	146	
Q16	Q16_Bon	-0.398	4.68	0.403	214	
Q12	Q12_O	-0.402	4.48	0.334	201	
Q14	Q14_Bon	-0.591	4.30	0.149	89	
Q19	Q19_O	-0.447	4.03	0.192	146	
Q19	Q19_N	0.429	3.87	0.192	152	
Q24	Qu	0.430	3.60	0.166	141	
Q21	Q21_Mauv	0.660	3.50	0.105	58	
Q11	Q11_Bon	-0.423	3.50	0.161	141	
Q16	Q16_Mauv	1.138	3.40	0.088	19	
Q27	Cher	1.425	3.37	0.085	12	
Q21	Q21_Bon	-0.433	2.52	0.091	97	
Q24	Rar	-0.639	2.48	0.071	44	
Q14	Q14_Mauv	0.414	2.35	0.085	99	

Source: Authors' elaboration using (RStudio)

Table 2: Positive and negative contributions of Axis 1

Contribution + axe 1	Contribution - axe 1
Q10_Mauv	Q10_Bon
Q12_N	Q16_Bon
Q11_Mauv	Q12_O
Q16_Moy	Q14_Bon
Q17_Moy	Q19_O
Q19_N	Q11_Bon
Qu	Q21_Bon
Q21_Mauv	Rar
Q16_Mauv	
Cher	
Q14_Mauv	

Source: Authors' elaboration using (RStudio)

The first axis opposes regular dissatisfied users, who criticize cleanliness, lighting, and information, report a lack of safety, and consider pricing high, against occasional users who express overall satisfaction and feel safe. This opposition reflects a fundamental divide between captive users (who have no alternative) and occasional

users (who can choose other modes of transport). Dissatisfied users are primarily women, students, and young adults (18–35 years), while satisfied users are older (46–60 years), employees, and liberal professionals.

Axis 2

Table 3: Positive and negative contributions of Axis 2

Variables actives						
Show 100 entries		Search:				
Variable	Level	Coord	Contrib	Cos2	Count	
Q14	Q14_Mauv	-0.873	15.69	0.379	99	
Q16	Q16_Moy	0.859	9.06	0.205	65	
Q16	Q16_Mauv	-1.545	9.44	0.163	19	
Q17	Q17_Moy	1.123	8.02	0.162	34	
Q24	Rar	0.896	7.35	0.139	44	
Q11	Q11_Bon	-0.455	6.08	0.186	141	
Q19	Q19_O	0.425	5.49	0.174	146	
Q19	Q19_N	-0.408	5.28	0.174	152	
Q11	Q11_Moy	0.451	5.12	0.139	121	
Q14	Q14_Bon	0.505	4.72	0.109	89	
Q14	Q14_Moy	0.377	3.25	0.083	110	
Q10	Q10_Moy	0.332	3.10	0.091	135	
Q10	Q10_Bon	-0.309	2.90	0.092	146	
Q21	Q21_Moy	-0.282	2.37	0.073	143	

Source: Authors’ elaboration using (RStudio)

Table 4: Positive and negative contributions of Axis 2

Contribution + axe 2	Contribution - axe 2
Q10_Bon	Q11_Moy
Q11_Bon	Q14_Moy
Q14_Bon	Q10_Moy
Fr	Q17_Moy
Q21_Bon	Q16_Moy
Q19_N	Qu

Source: Authors’ elaboration using (RStudio)

The second axis opposes users expressing average satisfaction, often occasional, against more critical, users dissatisfied with cleanliness, lighting and information, and reporting a lack of safety. This axis highlights a more subtle distinction based on frequency of use and level of tolerance to inconveniences.

Supplementary variables

Axis 1

Table 5: Coordinates of supplementary variables on Axis 1

Variables supplémentaires									
Show	20	entries		Search:					
Variable	Level	Class	Coord	Cos2	Count	V.test	P.value		
Q5	Baba ali	Qualitative	0.599	0.011	9	1.820	0.068		
Q5	Boufank	Qualitative	0.414	0.009	15	1.640	0.100		
Q5	Birtouta	Qualitative	0.317	0.010	28	1.690	0.091		
Q3	Etu	Qualitative	0.248	0.040	118	3.460	0.001		
Q2	18_25 ans	Qualitative	0.166	0.024	138	2.650	0.008		
Q1	F	Qualitative	0.136	0.021	159	2.510	0.012		
Q3	SE	Qualitative	0.094	0.001	37	0.610	0.543		
Q5	Caroubier	Qualitative	0.069	0.000	11	0.230	0.816		
Q5	El_harrach	Qualitative	0.062	0.000	30	0.360	0.719		
Q5	Chiffa	Qualitative	0.056	0.000	18	0.240	0.808		
Q2	26_35 ans	Qualitative	0.042	0.000	60	0.370	0.714		
Q5	egha	Qualitative	-0.001	0.000	10	0.000	0.997		
Q5	ain_nadjae	Qualitative	-0.004	0.000	9	-0.010	0.990		
Q5	El_alfroun	Qualitative	-0.019	0.000	19	-0.090	0.931		
Q2	Moins 18 ans	Qualitative	-0.051	0.000	13	-0.190	0.852		
Q5	Mouzaia	Qualitative	-0.076	0.000	17	-0.320	0.747		
Q5	Biida	Qualitative	-0.081	0.002	67	-0.750	0.454		
Q3	S	Qualitative	-0.125	0.006	85	-1.360	0.173		
Q1	H	Qualitative	-0.156	0.021	139	-2.510	0.012		
Q2	36_45 ans	Qualitative	-0.176	0.004	31	-1.030	0.302		
Showing 1 to 20 of 30 entries						Previous	1	2	Next

Source: Authors' elaboration using (RStudio)

Table 6: Coordinates of supplementary variables on Axis 1

Variables supplémentaires									
Show	20	entries		Search:					
Variable	Level	Class	Coord	Cos2	Count	V.test	P.value		
Q5	H.Dey	Qualitative	-0.177	0.003	26	-0.940	0.347		
Q5	alger	Qualitative	-0.212	0.002	12	-0.750	0.455		
Q5	ateliers	Qualitative	-0.260	0.002	10	-0.840	0.403		
Q3	col_ly	Qualitative	-0.285	0.004	14	-1.090	0.276		
Q5	Gue_do_cno	Qualitative	-0.314	0.003	9	-0.950	0.340		
Q2	46_60 ans	Qualitative	-0.315	0.015	39	-2.110	0.035		
Q3	PL	Qualitative	-0.352	0.011	24	-1.800	0.072		
Q5	B.Mered	Qualitative	-0.380	0.005	10	-1.220	0.222		
Q2	Plus de 60 ans	Qualitative	-0.414	0.010	17	-1.750	0.080		
Q3	R	Qualitative	-0.484	0.017	20	-2.240	0.025		
Showing 21 to 30 of 30 entries						Previous	1	2	Next

Source: Authors' elaboration using (RStudio)

Modalities with a **V.test** greater than 2 are well represented on the first axis, reflecting their significant contribution to its structuring (Soriano et al., 2018). These include Student, 18–25 years, Female, Male, 46–60 years, Retired.

Axis 2

Table 7: Coordinates of supplementary variables on Axis 2

Variable	Level	Class	Coord	Cos2	Count	V.test	P.value
Q5	B.Mered	Qualitative	0.588	0.012	10	1.890	0.059
Q5	ain_nadja	Qualitative	0.454	0.006	9	1.380	0.167
Q5	Blida	Qualitative	0.391	0.044	67	3.630	0.000
Q2	Moins 18 ans	Qualitative	0.377	0.006	13	1.390	0.165
Q3	col_ly	Qualitative	0.364	0.007	14	1.390	0.163
Q5	El_alfroun	Qualitative	0.352	0.008	19	1.580	0.114
Q5	Birtouta	Qualitative	0.250	0.006	26	1.330	0.183
Q5	egha	Qualitative	0.226	0.002	10	0.730	0.467
Q2	26_35 ans	Qualitative	0.188	0.009	60	1.630	0.104
Q3	S	Qualitative	0.113	0.005	85	1.230	0.219
Q3	Etu	Qualitative	0.069	0.003	118	0.970	0.333
Q5	Caroubior	Qualitative	0.052	0.000	11	0.180	0.861
Q2	18_25 ans	Qualitative	0.029	0.001	138	0.470	0.637
Q2	46_60 ans	Qualitative	0.013	0.000	39	0.090	0.930
Q1	F	Qualitative	0.002	0.000	150	0.040	0.868
Q1	H	Qualitative	-0.002	0.000	139	-0.040	0.968
Q3	PL	Qualitative	-0.023	0.000	24	-0.120	0.907
Q5	Bou/ank	Qualitative	-0.169	0.002	15	-0.670	0.504
Q2	36_45 ans	Qualitative	-0.188	0.004	31	-1.100	0.271
Q3	SE	Qualitative	-0.237	0.008	37	-1.540	0.124

Showing 1 to 20 of 30 entries

Previous 1 2 Next

Source: Authors' elaboration using (RStudio)

Table 8: Coordinates of supplementary variables on Axis 2

Variable	Level	Class	Coord	Cos2	Count	V.test	P.value
Q5	Mouzaia	Qualitative	-0.240	0.003	17	-1.020	0.309
Q5	El_harrach	Qualitative	-0.244	0.007	30	-1.400	0.160
Q5	Chiffa	Qualitative	-0.271	0.005	18	-1.180	0.237
Q5	alger	Qualitative	-0.362	0.006	12	-1.280	0.201
Q5	atehers	Qualitative	-0.365	0.005	10	-1.170	0.241
Q5	Baba ali	Qualitative	-0.419	0.005	9	-1.270	0.203
Q5	H.Dey	Qualitative	-0.458	0.020	26	-2.440	0.015
Q3	R	Qualitative	-0.678	0.033	20	-3.130	0.002
Q2	Plus de 60 ans	Qualitative	-0.879	0.047	17	-3.730	0.000
Q5	Que_de_cne	Qualitative	-1.080	0.036	9	-3.280	0.001

Showing 21 to 30 of 30 entries

Previous 1 2 Next

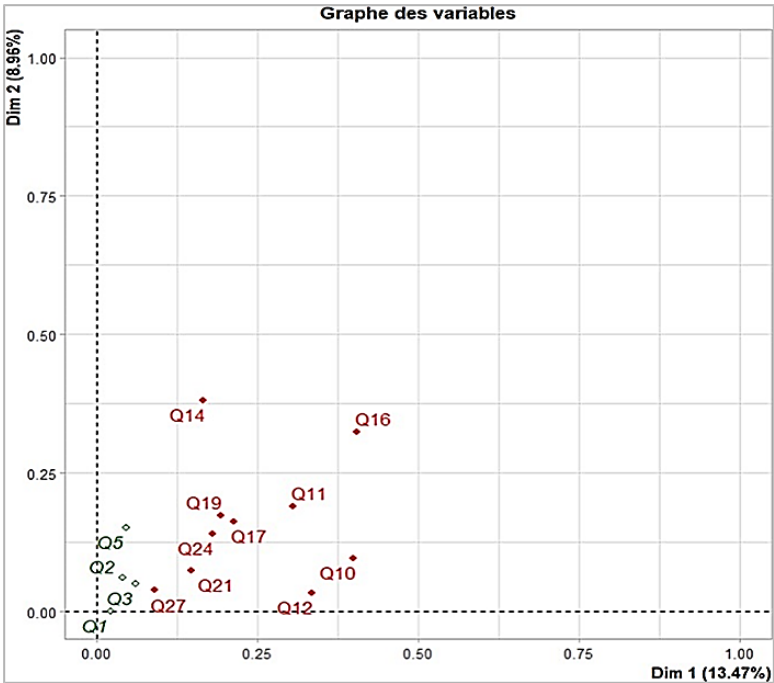
Source: Authors' elaboration using (RStudio)

Modalities with a V.test greater than 2 are well represented on the second axis, reflecting their significant contribution to its structuring. These include Blida, Hussein. Dey, R, over 60 years, Gué de Constantine .

3.3 Projection of Variables and Individuals

The projection of active variables onto the factorial plane shows a distribution into three main zones.

Fig. 2: Projection of active variables onto factorial planes 1 and 2

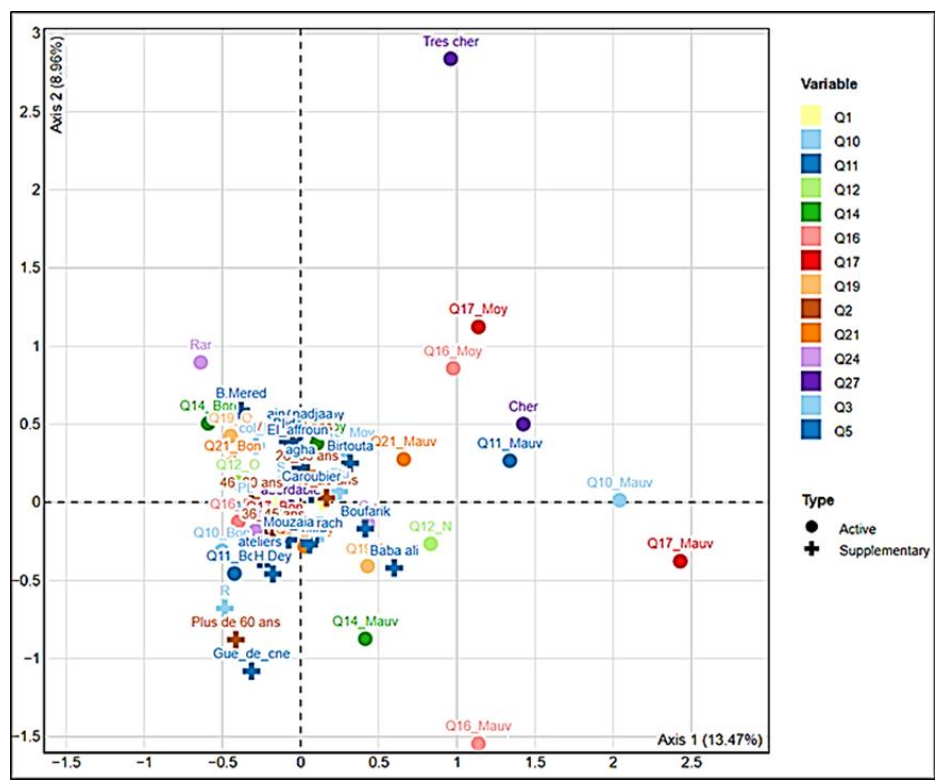


Source: Authors’ elaboration using (RStudio)

- A first compact group brings together sociodemographic variables (age, sex, occupation) that contribute little to both axes.
- A second group includes variables related to cleanliness, lighting, safety, and information, which contribute moderately to the structuring of the axes.
- A third, more distinct group is formed by variables of train cleanliness and quality of on-train information, which contribute more to the structuring of the second axis.

Cloud of modalities

Fig. 3: Cloud of modalities on the first plane



Source: Authors' elaboration using (RStudio)

The cloud of individuals shows a concentration of points around the center, indicating general homogeneity of customer profiles. The confidence ellipse that encompasses the majority of observations highlights this distribution, with no marked presence of very distinct profiles. This suggests that the behaviors and perceptions of users on this line are generally close to one another.

3.4 Summary of Results

Punctuality and cleanliness are the main sources of dissatisfaction, especially among regular users, young people, and women. Onboard comfort and passenger information are also rated poorly, while safety is seen as better on trains than in stations. Pricing is considered high relative to the poor service quality perceived by users.

4. Discussion

4.1 Convergences with International Literature

The results of this study are consistent with those of other research conducted in similar contexts. Khatun et al. (2025) studied passenger satisfaction on intercity trains in Bangladesh and also identified punctuality as the most critical factor, followed by cleanliness and comfort a hierarchy identical to that observed on the Alger-El Affroun line. Similarly, Dibiku (2024) highlighted the importance of reliability and cleanliness as major determinants of satisfaction for the Ethiopia-Djibouti railway. In both cases, captive users (with no modal alternative) reported greater dissatisfaction than occasional users, which aligns with our opposition between regular and occasional users on Axis 1.

Furthermore, the study by Wisenthige & Wickramasinghe (2024) in Sri Lanka shows that real-time passenger information and perceived safety in stations are priority improvement levers in developing countries, corroborating our results concerning lighting and information. In Europe, Ntereka et al. (2020) showed that punctuality remains the most important dimension for users of Greek railways, but cleanliness is generally rated higher there than in Algeria, suggesting an investment gap in maintenance.

4.2 Specificities of the Algerian Context and Divergences

Several specificities of the Algerian context emerge from this study. First, the differentiated perception of safety by gender is more marked: women feel less safe than men, particularly in stations. This gender dimension of safety is less

documented in standard international literature, although Mogaji (2025) mentions similar disparities in emerging countries. Second, the importance of pricing as a factor of dissatisfaction is higher in Algeria than in European (Stoilova, 2019) or Asian studies Khatun et al (2025), likely reflecting stronger budgetary constraints of Algerian households and an unfavorable price-quality ratio. Third, the satisfaction of older users (46–60 years) contrasts with the dissatisfaction of young people (18–35 years), suggesting a generational shift in expectations: young people, more accustomed to digital services and international standards, are more demanding regarding punctuality and information. Bissell (2010) observed this phenomenon in a study on passenger experience, but it is less pronounced there.

4.3 Positioning Relative to Multi-Criteria Models

Our approach combining MCA and multi-criteria analysis distinguishes itself from previous work. While Bouraima et al. (2023) used IRN SWARA-CoCoSo models to evaluate railway systems in sub-Saharan Africa, and Černá et al (2025) proposed a multi-criteria framework for railway sidings, our study is one of the first to apply MCA to a specific line in Algeria. MCA allowed visualization of oppositions between sociodemographic profiles (age, sex, occupation) and satisfaction levels, which is rarely done in classical evaluations based on average scores (Zidani et al., 2024; Meziani, 2018). Compared to the PROMETHEE method used by Vilke et al (2020) for route selection, our MCA is more suited to analyzing subjective perceptions.

4.4 Implications for Transport Policy in Algeria

These results have important implications, widespread dissatisfaction with punctuality suggests that investments in signaling and traffic management are priorities (ART, 2025; Mekhalfa & Boubakour, 2021). The proposal for a centralized intelligent command post could address this need, improving cleanliness and comfort requires both investments in rolling stock (air conditioning, seats) and better maintenance Khaled & Sihem (2018). Finally, passenger information could be

improved through low-cost digital solutions, such as mobile applications or real-time display panels, following the recommendations of Mogaji (2025) for the digital transformation of railway services.

5. Conclusion and Perspectives

This research makes an original contribution to the evaluation of railway service quality in Algeria. It confirms that punctuality is the main factor of dissatisfaction, followed by cleanliness and comfort. The use of multiple correspondence analysis enabled a detailed analysis of user perceptions and a prioritization of improvement axes. Methodologically, the combination of MCA and multi-criteria analysis is an innovation for the Algerian context.

Thus, our objective was to objectively assess the perceived service quality on the Alger-El Affroun line and identify the factors of dissatisfaction, the objective evaluation of service quality was achieved through a mixed methodology (surveys, MCA, multi-criteria analysis) (Sharma et al., 2020), allowing the quantification of each criterion’s contribution. The determining factors of dissatisfaction are, in order of importance: punctuality, cleanliness, comfort, passenger information, perceived safety (especially in stations), and pricing deemed excessive, to improve the attractiveness of passenger transport, we propose targeted actions on traffic regulation, rolling stock renovation, real-time information, and safety reinforcement (Alamoudi et al, 2024).

6. Recommendations

Based on the findings of this study, several practical recommendations can be proposed to improve the overall quality, efficiency, and user experience of the transport system. These recommendations target key operational, infrastructural, and service-related aspects in order to enhance performance and better meet passengers’ expectations:

- **Implementation of a centralized intelligent command post** to optimize traffic regulation and reduce delays.

<i>Review EL'BAHITH - ENS - Bouzareah – Algiers</i>					
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- **Rolling stock renovation program** focusing on comfort (air conditioning, ergonomic seats) and cleanliness.
- **Real-time passenger information system** (digital displays at stations and mobile application) to improve transparency and reduce anxiety related to delays.
- **Reinforcement of safety in stations** (lighting, security personnel, cameras), particularly for female users.
- **Revision of the pricing policy** to better align prices with perceived quality.

7. Limitations of the Study

As with any empirical study, the findings should be interpreted in light of certain methodological and practical constraints. Recognizing these aspects helps identify promising directions for future research and opportunities to further improve subsequent investigations :

First, the study relies on users' daily perceptions without comparing them to measurable data (punctuality, cleanliness). Second, only current public transport users were surveyed, excluding those who have abandoned or never used these services. The sample, though sufficient for an initial analysis, does not cover all seasons or the diversity of user profiles, limiting statistical robustness. Finally, the multi-criteria analysis would have benefited from integrating user-defined prioritization of criteria. Future work should broaden the geographic scope and surveyed profiles, and combine qualitative and quantitative approaches.

8. Suggestions for Future Research

Building on the findings of the present study, several avenues for future research can be identified. These perspectives may contribute to a deeper understanding of public transport users' needs and support the development of more efficient and sustainable mobility systems :

Future research should conduct longitudinal surveys to track user satisfaction over time and assess service improvements on the Alger-El Afroun line. Comparative analyses with other countries and new technologies (e.g., real-time mobile apps) would help identify best practices and evaluate their impact. Studies should also explore why some residents avoid public transport, improve accessibility for people with reduced mobility, and examine multimodal integration and environmental impacts to guide sustainable investments.

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