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EXPLORING UNIVERSITY STUDENTS' PERCEPTIONS OF PUBLIC TRANSPORT IN MADRID

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ABSTRACT

Public transportation is essential for urban quality of life, especially in densely populated cities like Madrid, where university students are frequent users. This study analyzes their perceptions of Madrid's public transport, focusing on price, service quality, comfort, safety, accessibility, and environmental impact. Data were collected from 250 university students in Madrid during September and October 2024 and analyzed using IBM SPSS 27 with descriptive statistics.

Results show that price value and flexibility significantly influence satisfaction. Service quality—particularly punctuality and cleanliness—is key to user loyalty. Comfort and safety factors affect students' trust in public transport, while proximity and network integration encourage use. Environmental impact also drives preference over private vehicles. The findings support improvements in pricing, service quality, safety, and eco-friendly initiatives to promote continued use among students.

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1. Introduction

Public transportation is a crucial component of urban mobility, especially in large metropolitan areas where efficient and sustainable systems support the daily travel needs of millions of people. The user experience within public transportation, particularly for university students, is shaped by several factors, including satisfaction with service quality, perceptions of safety, accessibility, and the perceived environmental impact. This study focuses on these elements to understand how university students in Madrid perceive their public transportation systems. The perspectives derived from these perceptions are valuable as they can guide urban mobility policies and contribute to enhancing the overall quality of public transportation systems.

The transportation sector has undergone substantial transformations in recent years, driven mainly by technological advancements and an intensified focus on sustainability. The integration of digital tools and data analysis in urban planning has facilitated detailed examinations of mobility patterns and environmental impacts, contributing to more efficient transport systems. Despite extensive research in public transportation and sustainability, there remains a notable gap concerning user perspectives, particularly from university students. This demographic often relies heavily on public transportation yet has been underrepresented in studies exploring factors like user satisfaction, safety concerns, and environmental considerations.

This research aims to address these gaps by investigating university students' perceptions of public transportation in Madrid, with a focus on six key factors identified in previous literature: the price of transport services, service quality, comfort and convenience, perception of security, accessibility, and perceived environmental impact (De Oña, 2020; Eliasson, 2021; Jamei et al., 2022; Hörcher & Tirachini, 2021; Rahman, 2022; Watthanaklang et al., 2024)). By studying these factors, this research seeks to answer the central research question: How do university students in Madrid perceive and evaluate the public transportation system in terms of affordability, service quality, comfort, security, accessibility, and environmental sustainability?

The objectives of this study are twofold:

- To assess university students' satisfaction with public transportation in Madrid across the six factors mentioned.
- To explore how perceptions of public transport affordability, quality, comfort, security, accessibility, and environmental impact influence their willingness to use or continue using public transportation.

This research contributes to the understanding of how younger generations, who are more likely to prioritize environmental considerations, perceive the sustainability and effectiveness of public transportation options available to them. By focusing on university students, this study addresses an underrepresented perspective in the transportation literature, thereby adding valuable findings to the ongoing discourse on sustainable urban mobility.

2. Theoretical Framework

2.1. Public Transportation in Madrid

The Observatorio de la Movilidad Metropolitana (OMM) (2022–2023) outlines comprehensive data on public transportation use and trends across major Spanish metropolitan areas, with specific emphasis on regions such as Madrid. Public transport networks are instrumental in reducing urban congestion, providing efficient travel options, and fostering sustainable mobility choices. In 2022, the combined ridership of bus and rail services in Spain's metropolitan areas, including Madrid, reached over 3.2 billion trips. By 2023, this figure grew to 3.39 billion, reflecting the ongoing recovery and expansion of public transport post-COVID-19, supported by a 32.16% year-over-year ridership increase from 2021 to 2022 (OMM, 2022–2023).

In Madrid, the demand for public transport has steadily risen, partly attributed to ongoing investment in infrastructure and the adaptation of services to meet user needs. In 2022, the capital experienced an increase in public transport use, attributed to population density and an expanded network coverage. According to OMM (2022–2023), Madrid's public transport modal share stands at

approximately 24.3%, the highest among Spanish cities, highlighting the city's reliance on and commitment to public transportation. The network encompasses extensive rail and bus lines, reaching 128,384 kilometers of bus routes and 3,589 kilometers of rail lines across Spain, which enables convenient connectivity between urban and suburban areas.

The financial model behind Madrid's public transport system continues to evolve with significant annual investments. In 2022, around €913.4 million was allocated towards new infrastructure and fleet expansion, with Madrid receiving a substantial portion for its metro and bus systems. This investment strategy aims not only at enhancing service quality but also at advancing Madrid's sustainability goals by prioritizing eco-friendly transport modes. Consequently, Madrid's per capita transport emissions have shown a reduction as the city moves towards greener mobility options (OMM, 2022–2023).

The city's robust infrastructure includes advanced ticketing and operational efficiency metrics, with ongoing studies focusing on demand elasticity and regional connectivity. Moving forward, Madrid aims to further reduce vehicular reliance through increased public transport accessibility, cost efficiency, and rider satisfaction, which are supported by the expansion of multimodal options and integration with active transport modes such as cycling and walking pathways (OMM, 2022–2023).

2.2. Factors Influencing Travel Mode Choices Among University Students and the General Population

Several studies have explored the range of factors influencing individual travel mode choices.) Dingil et al. (2021) identified sociodemographic characteristics, trip attributes, mode-specific dynamics, and elements of the built environment as central factors in understanding travel choices within the general population. Similarly, related research (Islam & Saphores, 2022; Mwale et al., 2022; O'Driscoll et al., 2024) highlights that sociodemographic characteristic—such as age, race, education level, gender, vehicle ownership, occupation, and income—directly and indirectly shape mode choices. These factors also influence destination selection.In addition to sociodemographic influences, trip-specific characteristics like travel distance, time, and cost significantly affect mode choice. The built environment also plays an important role in shaping travel behavior. Factors such as population density and land use mix can impact travel distance and time, potentially reducing travel needs and discouraging private car use. Shorter distances within neighborhoods have been shown to promote active travel modes, such as walking and cycling, as evidenced in research by Barajas y Braun (2021); Ermagun y Levinson (2017) and Wolday (2023).Moreover, commuters' attitudes toward flexibility, comfort, convenience, cost, and safety of transport modes have been established as significant determinants of travel mode choice, according to studies by Liu et al. (2023); McGreevy et al. (2021); Watthanaklang et al. (2024) and Sogbe (2024)

With respect to university students, studies from around the globe have explored how sociodemographic, environmental, and trip-specific factors shape their travel behaviors, particularly their choice and frequency of transport mode use. Table 1 of the source article lists the factors used across various studies to investigate students' mode choice and usage frequency. While extensive research exists on student mode choices and frequency, only a few studies have specifically examined these aspects regarding ride-sourcing.).

2.3. Proposed Research Model

This study introduces a conceptual model to analyze university students' perceptions of public transportation in Madrid, based on factors proposed by key authors. The model incorporates six essential factors: price, service quality, comfort, safety, accessibility, and environmental impact. Each factor, drawn from prior research, includes targeted questions to examine its influence on students' satisfaction and usage decisions.

Table 1. Proposed Research Model

Authors	Factor	Theoretical Explanation of the Factor	Questions
Hörcher y Tirachini. (2021); Rahman (2022); Sukhov et al. (2022)	Price of public transport services	The "price" factor refers to how the cost of public transport services affects user satisfaction and the decision to continue using transport or switch to other modes. It also encompasses the perception of value for money.	1. I am satisfied with the price of public transportation compared to alternatives such as taxis or private vehicles. 2. I consider the price of public transportation fair in relation to the quality of service. 3. The flexibility of pricing (e.g., daily vs. monthly rates) influences my choice to use public transportation. 4. I would switch to another mode of transport if the public transport price significantly increased.
Chauhan et al. (2021); Rahman (2022); Sukhov et al. (2022)	Service quality	Service quality measures user satisfaction in terms of frequency, punctuality, cleanliness, comfort, and safety of public transport. These aspects are crucial for ensuring a positive travel experience.	1. The punctuality and frequency of public transport services influence my decision to keep using it. 2. The cleanliness of vehicles is important to my overall satisfaction with public transport. 3. The frequency of public transport services affects my willingness to use it regularly. 4. The availability of services during peak hours influences my satisfaction with public transport.
Chauhan et al. (2021); Rahman (2022); Sukhov et al. (2022)	Comfort and convenience	Comfort refers to the perceived level of convenience during public transport use, including seat availability, space, and conditions inside the vehicle.	1. I would continue using public transportation if it is comfortable and has sufficient seats available. 2. The temperature (air conditioning or heating) inside public transportation affects my travel experience. 3. The available space inside the vehicle influences my comfort during the trip. 4. The cleanliness and maintenance of the vehicles affect my comfort while traveling.
De Oña, 2020; Rahman (2022), Sukhov et al. (2022)	Perception of security	Security measures the user's confidence in their ability to travel without fear of accidents or safety issues, both inside the vehicle and at stations or stops.	1. My perception of security on public transportation influences my decision to use it. 2. I feel safe using public transportation at night. 3. The security at stations or stops affects my decision to use public transport. 4. The presence of security personnel or surveillance cameras enhances my perception of security in public transportation.
De Oña, (2020); Rahman (2022); Sukhov et al. (2022)	Accessibility	Accessibility refers to the ease with which users can access public transport stops or stations and use the service, including proximity and ease of transfers.	1. The proximity of a public transportation stop or station to my residence or workplace affects my use of public transport. 2. I consider public transportation well connected with other options (e.g.,

			trains, buses, etc.). 3. The distance of stops influences my decision to use public transport. 4. Public transport is accessible regarding frequency of access to stops.
De Oña, 2020; Jamei et al., (2022); Sukhov et al. (2022)	Perceived environmental impact	Perceived environmental impact measures users' concern for the environment and how this concern influences their decision to use public transport over more polluting options like car usage.	1. The environmental impact of public transport affects my decision to use it. 2. The reduction of carbon emissions in public transport is a factor in my decision to use it. 3. I believe public transport in my city contributes to reducing air pollution. 4. I am willing to use public transport more if it contributes to a greater positive impact on the environment.

Source: Own elaboration, 2024.

3. Methodology

The methodology for this research employs a quantitative approach using IBM SPSS 27 for statistical analysis. The data was gathered through a structured survey distributed over September and October 2024, resulting in 250 valid responses. This survey, accessible via Google Forms and QR codes, was shared on social media, email, and in-person to capture a diverse university demographic. Questions were designed to assess perceptions of public transport in six categories: service price, service quality, comfort, security, accessibility, and environmental impact.

Responses were rated on a five-point Likert scale, allowing for a detailed understanding of user attitudes. The sampling method used was non-probabilistic and convenience-based, prioritizing accessibility for participants but recognizing limitations in generalizability. Descriptive statistical analysis was conducted on variables such as age, gender, university type, and frequency of public transport usage. This data was processed to produce frequencies, valid percentages, and cumulative percentages, offering insights into participant demographics and attitudes. The findings provide foundational data for assessing trends and characteristics within the sample.

4. Data Collection

4.1 Descriptive Data Analysis

A comprehensive descriptive analysis was conducted on the dataset to summarize the sociodemographic characteristics and response trends. With no exclusions due to missing or inconsistent data, the complete sample was included in the analysis, preserving the full diversity of responses. The data offers insights into participant demographics and perceptions, enabling a foundational understanding for further inferential analysis.

The data reveal a relatively balanced gender distribution: 48.8% of respondents identify as female, 47.2% as male, and 4% as "Other," indicating an inclusive demographic composition within the student cohort. A significant majority of participants (96%) were born between 2000 and 2009, representing a conventional age range for university students, while a smaller proportion, 4%, were born between 1980 and 1999, potentially indicating the inclusion of mature students or those enrolled in postgraduate programs.

All respondents indicated active university enrollment, which aligns with the survey's intent to capture the experiences and perspectives of currently enrolled students. Additionally, the distribution between private and public institution attendees shows that 60.8% attend private universities, while 39.2% are enrolled in public institutions. This disparity may suggest specific demographic or regional trends, offering a nuanced context for interpreting the data within the higher education landscape.

Table 2. Sociodemographic data of the sample.

Analysis Field	Category	Frequency	Percentage
Gender	Female	122	48.8%
	Male	118	47.2%
	Other	10	4%
Year of Birth	1980-1999	10	4%
	2000-2009	240	96%
University Enrollment	Yes	250	100%
Type of University	Private	152	60.8%
	Public	98	39.2%

Source: Own elaboration, 2024

The data reveals a strong reliance on public transportation among university students for their daily commute to the university, with 80% reporting very frequent usage. Only a small proportion of students, around 8.8%, indicate that they never use public transport, and minimal percentages are observed for those who use it sometimes, frequently, or rarely. This pattern underscores public transportation's crucial role in students' routines, suggesting it is both accessible and essential for most.

Weekly hours dedicated to public transport use vary significantly among students. The largest segment, 28.8%, spends less than 1 hour commuting weekly, possibly indicating close proximity to their destination or efficient routes. On the other hand, 21.6% of students report spending 3-5 hours per week, while 19.2% spend 1-3 hours. Notably, 16% report more than 10 hours of weekly travel, potentially due to living further away or requiring multiple transfers. These figures indicate that while many students have limited commute times, a considerable subset has more substantial weekly travel commitments, which may impact their satisfaction and overall experience with public transportation.

The frequency of switching between transport modes shows diverse patterns among students. Approximately a quarter switch very frequently (24.8%), while 25.6% rarely do so. Another 19.2% report sometimes switching modes, while 18.4% never switch. This indicates that a significant number of students rely on multiple forms of transport to reach their destination, which may affect their satisfaction depending on the ease of transfers and the convenience of available options.

Regarding preferred modes of transport, metro is the most commonly used, with nearly half of students (49.6%) relying on it as their primary means of transport. Buses are the second most popular choice (26.4%), while only 11.2% mainly use trains, and a small number (2.4%) opt for other modes. The preference for metro suggests it is perceived as reliable and efficient for urban transit, while buses remain essential for many students. The lower use of trains may reflect fewer routes aligned with student needs or less convenience.

In terms of daily usage, the data indicates that 80.8% of students are very likely to use public transport every day, highlighting a strong dependency on these services. However, 12.8% reported that daily use was not likely, possibly reflecting individual preferences or access issues. Smaller percentages fall into likely (3.2%) and unlikely (2.4%) categories. Overall, students generally show a high inclination towards regular public transport use, reinforcing its essential function in their routines.

The findings suggest that public transportation is highly valued by university students, especially metro and bus services, as primary means of reaching their destinations. The variation in weekly hours, the necessity of switching modes, and preferences for certain types of transport underscore the importance of reliable, accessible, and efficient options that meet students' specific needs. These insights highlight the need for transit authorities to consider factors like commute time, ease of transfers, and service availability to maintain high satisfaction and support students' ongoing reliance on public transportation.

Table 3. Public Transport Usage Data

Analysis Field	Category	Frequency	Percentage
Frequency of Public Transport Usage to University	Sometimes	16	6.4%
	Frequently	6	2.4%
	Very Frequently	200	80%
	Never	22	8.8%
	Rarely	6	2.4%
Weekly Hours Dedicated to Public Transport Usage	1-3 hours	48	19.2%
	3-5 hours	54	21.6%
	5-10 hours	36	14.4%
	More than 10 hours	40	16%
	Less than 1 hour	72	28.8%
Frequency of Switching Between Transport Modes	Sometimes	48	19.2%
	Frequently	30	12%
	Very Frequently	62	24.8%
	Never	46	18.4%
	Rarely	64	25.6%
Most Frequently Used Mode of Public Transport	Bus	66	26.4%
	Metro	124	49.6%
	Train	28	11.2%
	Other Modes	6	2.4%
Likelihood of Using Public Transport Every Day	Very Likely	202	80.8%
	Likely	8	3.2%
	Unlikely	6	2.4%
	Not Likely	32	12.8%

Source: Own elaboration, 2024.

5. Discussion and Results

This section presents the analysis and interpretation of the data collected, highlighting the main findings and their implications for public transportation among university students. The results provide insights into how various factors influence students' choices and perceptions regarding public transportation, focusing on areas such as service price, service quality, comfort and convenience, security perception, accessibility, and perceived environmental impact.

5. 1. Price of Public Transport Services

The analysis of the public transportation price factor among university students evaluates how cost influences user satisfaction and decision-making. Specifically, four questions were used to assess students' satisfaction regarding the affordability, perceived fairness, flexibility, and potential influence of price changes on their choice of transportation mode. This approach follows the framework established by De Oña (2020); Hörcher y Tirachini, (2021); Rahman (2022); Sukhov et al. (2022);, who emphasized the significant role of price in determining public transport satisfaction.

The findings indicate that 72% of students are satisfied with the price of public transportation in comparison to alternative modes, such as private vehicles or ride-sharing services. This suggests that

many students view public transportation as a cost-effective option, which aligns with Ahmed et al. (2021).

Regarding the perceived fairness of the price in relation to service quality, 68% of respondents felt that the price of public transport was fair given the level of service provided. This finding is consistent with De Oña (2020), who noted that a well-priced service that meets basic service expectations can positively impact user satisfaction and loyalty.

Price flexibility —such as the availability of daily, weekly, or monthly fare options— was also an influential factor. 65% of students reported that flexible pricing options affected their choice to use public transportation regularly. This supports research by Sukhov et al. (2022), which highlighted that flexible pricing plans can cater to diverse usage patterns, making public transport more appealing for different segments of the population, including students.

Lastly, when asked if a significant price increase would lead them to switch to an alternative mode of transportation, 59% of students indicated that they would consider other options if prices were to rise substantially. This finding underscores the sensitivity of students to price changes, which can directly impact their decision to continue using public transportation. Any noticeable increase in public transport costs without an equivalent improvement in service could deter regular users.

5.2. Service Quality

The analysis of service quality in public transportation for university students considered several key factors, including punctuality, frequency, cleanliness, and the availability of services during peak hours. These factors were assessed through four specific questions designed to gauge user satisfaction. This evaluation aligns with previous research on public transportation satisfaction (De Oña, 2020; Esmailpour et al., 2022; Sukhov et al., 2022), which highlights service quality as a major determinant in the continued use of public transport.

The results show that a majority of students (68%) expressed satisfaction with the punctuality and frequency of public transport services, indicating that consistent and reliable scheduling meets their expectations. This finding supports the work of Sukhov et al. (2022), who noted that punctuality and regular service intervals are essential for maintaining high levels of user satisfaction in public transport.

Regarding cleanliness, 62% of respondents rated the cleanliness of public transport vehicles as satisfactory or highly satisfactory,), who identified cleanliness as a crucial factor that impacts the overall travel experience. Clean vehicles contribute to a positive perception of the service, which is particularly important for users who rely on public transportation daily.

The frequency of service was also an influential factor, with 55% of students indicating that frequent service positively influenced their decision to use public transportation regularly. This aligns with De Oña (2020) assertion that frequent and accessible transport options are vital for user retention, particularly among young adults who depend on flexible travel options to accommodate varying schedules.

Finally, the availability of services during peak hours was highlighted as a critical factor, with 70% of students reporting satisfaction with peak-hour service availability. This finding emphasizes the importance of resource allocation to match high-demand periods, confirming insights from De Oña (2020) about the need for efficient public transport systems that accommodate peak travel times.

5.3. Comfort and Convenience

The analysis of the comfort and convenience factor reveals the impact of perceived comfort on university students' continued use of public transportation. Following the framework of Atombo and Wemegah, (2021); Benoliel et al. (2021); Chauhan et al. (2021); Sukhov et al. (2022), y Jamei et al. (2022), this report examines aspects such as seat availability, temperature, space, and cleanliness within public transport vehicles.

The data shows that 78% of students would continue using public transportation if they find it comfortable and adequately provided with seating options. This result emphasizes the importance of seat availability, as it contributes significantly to students' satisfaction with their commuting experience. Atombo y Wemegah, (2021) y Benoliel et al. (2021),also noted that adequate seating is critical for enhancing perceived comfort among public transport users.

Regarding temperature control, 65% of respondents indicated that temperature management (air conditioning or heating) affects their travel experience. Proper temperature regulation is essential in ensuring a pleasant journey, as discomfort due to temperature fluctuations can negatively impact user experience, as suggested by Sukhov et al. (2022).

When questioned about available space within the vehicle, 70% of students stated that the amount of space influences their comfort level during transit. This aligns with De Oña (2020), who highlighted that spaciousness in public transport is directly related to user comfort and overall satisfaction.

Lastly, 81% of students reported that the cleanliness and maintenance of vehicles impact their comfort while traveling. This finding is supported by studies from both de Jamei et al. (2022) and Sukhov et al. (2022) which emphasize that clean and well-maintained transport facilities are essential in fostering positive commuting experiences.

5.4. Perception of Security

The analysis of security perception in public transportation underscores its significant impact on university students' choices and comfort. As highlighted by De Oña (2020); Sukhov et al. (2022), y Wang et al. (2023), security in public transport encompasses users' confidence in traveling without fear of accidents or safety concerns, both within vehicles and at transit stations.

The data reveals that 75% of students feel that their perception of onboard security influences their decision to use public transportation regularly. This finding aligns with the view that a sense of safety plays a fundamental role in users' willingness to utilize public transit, as noted by Sukhov et al. (2022).

Regarding nighttime use, only 58% of respondents feel secure using public transportation during nighttime hours.

In terms of station safety, 68% of students report that security at stops and stations impacts their decision to use public transport. This aligns with De Oña (2020), who emphasize that well-secured and monitored stations can encourage usage by fostering a sense of safety among users.

Additionally, 82% of respondents believe that the presence of security personnel or surveillance cameras enhances their perception of safety in public transport.

5.5. Accessibility

The analysis of accessibility in public transportation highlights its importance in shaping university students' usage patterns and overall satisfaction. Accessibility, as defined by Rasca y Saeed (2022) and Sukhov et al. (2022), refers to the ease with which users can reach public transport stops or stations and utilize the service, considering aspects such as proximity and transfer convenience.

The data indicates that 72% of students feel that the proximity of a public transport stop or station to their residence or workplace significantly affects their use of public transportation. This finding underscores the importance of convenient access points for public transport, supporting Sukhov et al. (2022), who highlight proximity as a critical factor in fostering regular usage.

Moreover, 68% of respondents believe that public transportation is well connected to other transport options, such as trains and buses, who emphasize that a well-integrated transport network encourages multi-modal journeys and increases overall accessibility.

When considering the distance to stops, 65% of students report that the distance from their location to a public transport stop influences their decision to use the service. This aligns with Rasca y Saeed (2022), who found that shorter distances to transit points correlate positively with higher usage rates, as convenience is a key motivator for choosing public transport over other options.

Additionally, 70% of students feel that public transportation offers sufficient accessibility in terms of the frequency of access to nearby stops. This supports the findings by Sukhov et al. (2022), which suggest that the regularity and frequency of accessible stops are crucial in ensuring a positive user experience and sustaining user satisfaction.

5.6 Perceived Environmental Impact

The analysis of perceived environmental impact reveals its substantial role in influencing university students' decisions to use public transportation. As described by Ribeiro and Fonseca (2022) and

Sukhov et al. (2022), perceived environmental impact encompasses users' concern for the environment and how this concern shapes their decision to choose public transport over more polluting alternatives like personal vehicles.

The data indicates that 78% of students feel that the environmental impact of public transportation affects their decision to use it, highlighting a significant environmental awareness among students. This finding aligns with Sukhov et al. (2022), who emphasize that the environmental implications of transport choices are increasingly influential, particularly among younger generations who prioritize sustainability.

Additionally, 70% of respondents consider the reduction of carbon emissions a factor in their decision to use public transport. This response mirrors the findings of Ribeiro y Fonseca (2022), who identified that lower emissions can be a compelling motivator for public transport adoption, as it aligns with the users' desire to minimize their ecological footprint.

Moreover, 65% of students agree that public transport in their city contributes to reducing air pollution, which supports Jamei et al. (2022)who noted that environmentally conscious individuals are more likely to support and use services that visibly contribute to a cleaner urban environment.

Finally, 85% of participants express willingness to increase their public transport use if it could lead to a more positive environmental impact. This high level of commitment reflects that clear environmental benefits are likely to encourage higher public transport adoption, particularly among individuals who are environmentally aware.

6. Conclusions

This study underscores the importance of several key factors that shape university students' satisfaction with and willingness to use public transportation in Madrid. The analysis reveals that elements such as price, service quality, comfort, security, accessibility, and perceived environmental impact are significant in influencing students' transportation choices and experiences. These findings are consistent with the study's objectives and provide insights into potential improvements for public transportation systems that cater specifically to student needs.

Price emerges as a critical factor in students' decision-making regarding public transport use. Affordability and perceived value play essential roles in encouraging usage, suggesting that pricing strategies attentive to students' budgets could enhance satisfaction and increase ridership. Providing flexible options and maintaining reasonable fares are likely to support a more favorable perception of public transportation among this demographic.

The quality of service, particularly regarding punctuality, cleanliness, and availability during peak hours, also significantly affects students' satisfaction and their willingness to rely on public transport. When services run on time and vehicles are well-maintained, students feel that their time is respected, which fosters loyalty and sustained use. Ensuring that public transportation meets these expectations would likely promote greater satisfaction and retention of users.

Comfort is another influential factor in shaping students' perceptions. Key elements such as the availability of seating, temperature control, and adequate space contribute to their overall experience on public transport. Enhancing these aspects could make public transportation a more appealing and comfortable choice, leading to more consistent use by students.

Security perception plays a crucial role as well. Feelings of safety—both on board and at transit stations—directly impact students' willingness to use public transportation, especially during nighttime hours. Visible security measures, such as surveillance cameras and the presence of security personnel, contribute to a stronger sense of safety, which encourages more frequent use.

Accessibility also proves to be fundamental in determining students' public transport use. Factors such as the proximity of transport stops, effective network connectivity, and the frequency of available services significantly influence decisions to rely on public transport. High accessibility reduces barriers to usage and encourages students to adopt public transportation as a regular option for commuting.

The perceived environmental impact of public transportation is another important consideration for students. Many respondents indicated a greater willingness to use public transport if they felt it contributed positively to environmental sustainability. This environmentally conscious perspective suggests that promoting the ecological benefits of public transportation could play a role in increasing adoption rates among younger generations.

7. Contributions, Limitations, and Future Research Directions

The findings of this study offer valuable contributions to the understanding of factors influencing public transportation usage among university students. Key aspects such as price, service quality, comfort, safety perception, accessibility, and perceived environmental impact emerged as significant determinants affecting students' satisfaction and willingness to use public transportation.

One primary contribution of this research is highlighting the importance of affordability and flexibility in pricing, which directly impacts students' decisions to utilize public transit. Additionally, the emphasis on service quality, specifically factors like punctuality, cleanliness, and peak-hour availability, aligns with broader transportation research, emphasizing that meeting these expectations can foster loyalty and sustained usage.

This study also underscores the essential role of comfort, where availability of seating, temperature control, and cleanliness notably influence user satisfaction. Safety perceptions, especially regarding nighttime travel and station environments, play a critical role in shaping trust and confidence in public transportation systems.

Limitations of the study include the specific demographic focus on university students in Madrid, which may restrict the generalizability of findings to other regions or age groups. Further, while the study provides insights into several influencing factors, it does not exhaustively examine external variables like socio-economic backgrounds or detailed psychological motivations, which could deepen understanding.

Future research should expand beyond the university demographic to explore how these factors influence different population groups. Additionally, investigating how technological advancements in public transport, like real-time tracking and app-based services, affect satisfaction and usage could provide valuable insights. Exploring the impact of changing environmental policies on public transport perceptions may also reveal trends that influence sustainable transportation choices across diverse urban populations.

7.1. Conflict of Interests and Ethics

The authors declare no conflict of interests. The authors also declare full adherence to all journal research ethics policies, particularly regarding the anonymity of human subjects and obtaining consent to publish.

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