

Quality of public transportation service in Latin America

Calidad del servicio en el transporte público en Latinoamérica

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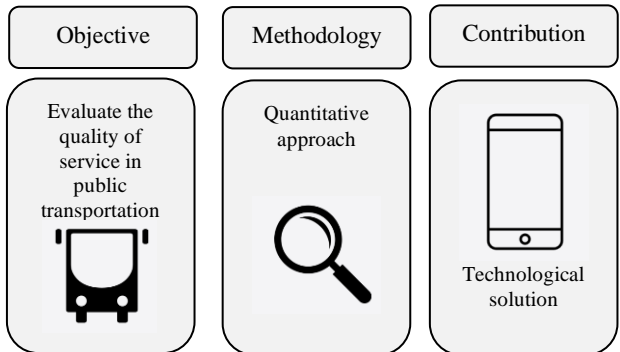
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Abstract

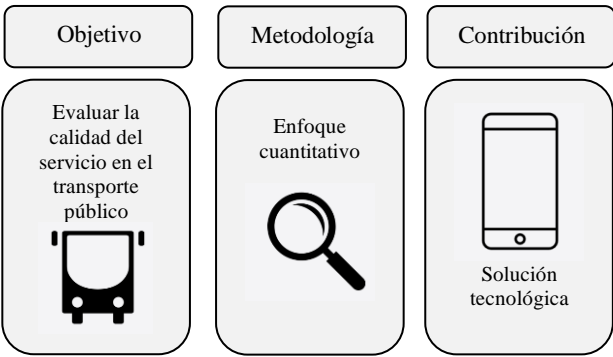
Currently, urban public transportation plays a crucial role in society, as it meets people's mobility needs by providing an economically accessible option for moving from one place to another. However, these systems have several areas for improvement, with the low quality of service being a significant issue that negatively affects the majority of its users. For this reason, the present study aims to analyze perceptions of service quality among public transportation users in various Latin American countries. To achieve this, a methodology based on two questionnaires was employed: the first measures the quality of urban transportation service, with a reliability level of 0.9, calculated using Cronbach's alpha, and the second, specifically designed for this study, evaluates the perception of concessionaires regarding the service they provide in public transportation.



Public transportation, Latin American, society

Resumen

En la actualidad, el transporte público urbano desempeña un papel crucial en la sociedad, ya que satisface la necesidad de movilidad de las personas, ofreciendo una opción económicamente accesible para trasladarse de un lugar a otro. No obstante, estos sistemas presentan diversas áreas de mejora, destacándose la baja calidad del servicio, que impacta negativamente a la mayoría de sus usuarios. Por esta razón, el presente estudio tiene como objetivo analizar las percepciones sobre la calidad del servicio entre los usuarios del transporte público en diversos países de América Latina. Para ello, se empleó una metodología basada en dos cuestionarios: el primero mide la calidad del servicio de transporte urbano, con un nivel de confiabilidad de 0.9, calculado mediante el alfa de Cronbach, y el segundo, diseñado específicamente para este estudio, evalúa la percepción de los concesionarios respecto al servicio que brindan en el transporte público.



Transporte público, América Latina, Sociedad

Area: Development of strategic leading-edge technologies and open innovation for social transformation

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1. Introduction

Most countries rely significantly on an efficient public transportation system to facilitate the daily mobility of their citizens. Within this framework, ensuring the quality of public transportation services is essential to enhance the user experience. Likewise, analyzing users' perceptions of the service is key to identifying areas for improvement and ensuring a system that meets the needs of the community.

For this reason, this research focuses on analyzing the perspective of public transportation users by collecting their opinions through a questionnaire.

The objective of this analysis is to contribute a proposal that drives the development and continuous improvement of the urban public transportation system.

This leads to the formulation of a hypothesis aimed at addressing the deficiencies in the quality of public transportation services, aligning with the general objective and specific objectives outlined in the research, which arise from diverse perspectives on this issue.

The structure of the research work consists of the following sections: abstract, introduction, justification, problem statement, hypothesis, general and specific objectives, theoretical framework, experimental methodology, results, analysis and discussions, conclusion, bibliography, and appendices. This organization allows the information to be presented in a clear, coherent, and orderly manner.

1.1 Justification

The opinions and experiences of users are key to identifying both the strengths and areas for improvement in the public transportation system. For this reason, focusing the project on a study of service quality will provide essential information to design and implement significant improvements that contribute to optimizing the system as a whole.

This research is relevant because, by collecting and analyzing data on user expectations and needs, it is possible to identify critical points that require intervention and adjustments to enhance service quality.

Furthermore, considering the fundamental role that public transportation plays in the daily lives of the population, this study can have a positive impact on citizens' quality of life by ensuring an efficient, safe, accessible, and high-quality transportation system.

1.2 Problem

Globally, the digitalization of public transportation is gaining relevance as a key component within strategies aimed at more sustainable and efficient mobility [Organization for Economic Co-operation and Development, n.d.].

In this context, the rapid advancement of digital technologies worldwide presents a unique opportunity to improve public transportation services, optimizing their use through projects that integrate technological solutions and strategies promoting social inclusion, accessibility, and economic and financial sustainability. However, despite being one of the most widely used means of transportation by the population, public transportation faces significant challenges in terms of service quality, which directly impacts mobility and the well-being of individuals.

In light of this situation, the following research question arises: How do users perceive the quality of urban public transportation services in Latin America?

1.3 Hypothesis

Users of urban public transportation are not receiving a service that meets adequate quality standards

1.4 Objectives [General and Specific]

General Objective:

To examine the opinions and experiences of users of urban public transportation in Latin America, with the aim of developing proposals that drive continuous improvement of the public transportation system during the period from August 2023 to August 2024.

Specific Objectives:

- Identify the key aspects that define the quality of service in public transportation in Latin America.

- Analyze users' perceptions of the quality of service in urban public transportation.
- Propose strategies and actions for the continuous improvement of urban public transportation.

2. Theoretical Context

Pérez and Pinto [2022], in their study titled “Satisfaction with Public Transportation Services among University Students”, propose that to evaluate service satisfaction, it is essential to apply choice models based on users' travel behavior, incorporate satisfaction indicators, and consider the assessments of various stakeholders, setting aside subjective and individual aspects of users. [p. 4].

For their part, Naranja and Caisa [2023] define quality as the adjustments made to the service to ensure it meets its characteristics in an outstanding manner, according to the customer's evaluation.

Similarly, Arroyo and Yerovi [2022] point out that to assess public transportation services, it is essential to take into account users' perceptions by analyzing various dimensions that comprise it, such as trust, safety, sensitivity, empathy, and material aspects.

3. Methodology

This study adopts a quantitative, descriptive, and cross-sectional approach, aiming to analyze the perception of urban public transportation services during the period from August 2023 to August 2024, evaluating four dimensions: service quality, routes, pricing, and promotions.

For data collection, primary sources were used through the application of two questionnaires. The first, designed in 2018 with 70 items, was adapted for this research, reducing it to 42 items with Likert-type responses. This questionnaire assesses the quality of public transportation services in Latin America and has a reliability level of 0.9 according to Cronbach's alpha, indicating excellent reliability in the scales. In detail, the reliability of each dimension was also measured using Cronbach's alpha, yielding the following results: dimension 1, related to service quality, showed a coefficient of 0.9, considered excellent; dimension 2, concerning routes, reached 0.89, classified as good; dimension 3, regarding pricing, obtained 0.72, rated as acceptable; and dimension 4, on promotions, recorded 0.8, also considered good.

The second questionnaire consists of 10 items with dichotomous, multiple-choice, and open-ended responses, designed to understand the perception of concessionaires regarding the services they provide in public transportation.

On the other hand, the development of the mobile application followed a structured life cycle in the following stages:

Planning: The application requirements were defined, and development environments were configured, including React Native, Node, Visual Studio Code, Android Studio, and Xcode. **Design:** Using Figma, user interfaces and interactive prototypes were created to serve as the foundation for development.

Development: The user interface and application logic were implemented using React Native, integrating Supabase to manage authentication, data storage, and cloud services. **Deployment:** The production environment for Supabase and Google Maps APIs will soon be configured to ensure a stable environment.

4. Results

The analysis of the research results revealed unsatisfactory performance in the service quality dimension, as 43.37% of respondents rated the service as poor or very poor, particularly regarding the treatment by drivers and waiting times for routes. However, approximately 68.3% of participants expressed being very or completely willing to pay a higher fare in exchange for an improvement in urban public transportation services. Similarly, 68.6% showed a high level of agreement with the implementation of new payment methods to avoid handling cash, and 45% considered that payment verification through QR code readers would be the most suitable option.

As a solution to these issues, the development of a mobile application was proposed. To validate the feasibility and viability of the project, a second study was conducted targeting urban public transportation concessionaires. The results indicated that 90.5% of respondents believe an automated payment system could improve the operational efficiency of their companies, while 61.9% consider that this system would help reduce the losses and fraud that occur daily.

Nevertheless, the main concern of concessionaires lies in the potential resistance to change from public transportation users. Despite this, 85.7% are willing to hire services to implement automated payment systems, and within this group, 71.4% prefer mobile application technology, agreeing that the use of QR code readers would be the most effective method for payment verification.

5. Analysis and discussion

The results presented in the previous section reveal a significant demand from users for improvements in urban public transportation services. This demand primarily focuses on the digitalization of the sector, reflecting users' interest in having transportation companies implement alternative payment methods that offer greater flexibility and security when paying for the service. This approach aims not only to enhance service quality but also to optimize operational efficiency and enrich the user experience.

Based on these findings, a mobile application was developed, which provides the following functionalities:

- **Real-time tracking:** Allows users to locate transportation units on an integrated map within the application.
- **Digital payment methods:** Offers the ability to make payments via QR codes and recharge a virtual wallet using credit/debit cards, PayPal, SPEI, among other options.
- **Service evaluation:** Enables users to rate the service provided by drivers.
- **Alert system:** Includes an alarm feature for users who find themselves in risky situations inside the vehicle.

6. Future work

The project is progressing with the implementation of improvements to the mobile application, including the adoption of emerging technologies such as the **Internet of Things [IoT]**. This network will enable, among other things:

- **Detection of anomalous situations:** Through the use of sensors, events such as delays or route changes can be identified, allowing users to be notified in real time about any modifications to the service.

7. Conclusion

In summary, urban public transportation services have areas for improvement that need to be addressed to increase user satisfaction. The hypothesis proposed in this research is validated through the results obtained, which reflect the factors contributing to the poor quality of the service.

For this reason, it is essential to promote digital transformation in sectors such as public transportation, aiming to improve service management efficiency, reduce urban congestion by optimizing payment processing times, and foster opportunities for innovative business models.

In this way, the research objective is achieved by highlighting the importance of public transportation in people's daily lives, as well as its impact on mobility, urban development, and overall quality of life.

Finally, it is important to emphasize the crucial role played by Higher Education Institutions in Mexico in developing innovative projects that seek to provide solutions to real problems affecting millions of people today.

Declarations

Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Author contribution

Juárez-Juárez, Yesenia Janeth: Contributed to the project idea, research method, information analysis and technique.

Pino-Herrera, Javier: Contributed to research methods, information analysis, technique and conclusions.

Romero-Gracia, Carlos Alberto: Contributed to the research method, information analysis, technique and conclusions.

Availability of data and materials

Data are available on request.

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Abbreviations

IoT: Internet of Things

8. References

Background

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