



Influence of architectural characteristics on service quality in food markets: The case of Yurimaguas, Peru

Influencia de las características arquitectónicas en la calidad del servicio de mercados de abastos: Caso Yurimaguas, Perú

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ABSTRACT

This study analyzes the relationship between the architectural characteristics of the municipal market of Yurimaguas and the quality of service it provides to the population. Based on a quantitative approach, a structured survey was applied to 138 citizens, revealing a predominantly negative perception regarding the market's functionality, accessibility, and spatial organization. The Kendall's Tau-b statistical test indicated a positive and significant correlation between the architectural conditions of the facility and the perceived quality of service. Based on these findings, an architectural proposal was developed to reorganize the market through differentiated functional zoning, improved circulation systems, universal accessibility, and complementary services. This proposal aims to enhance the user experience and address the identified structural deficiencies while aligning with current regulatory standards. The research demonstrates that proper architectural planning not only impacts the operational performance of the market but also improves users' perception of service quality, contributes to the revitalization of public space, and strengthens the local economy. The results may serve as a foundation for future modernization initiatives in other markets across the Peruvian Amazon region, promoting a more sustainable and inclusive model of urban development.

Keywords: accessibility; architecture; market; urban planning; public services

RESUMEN

El presente estudio analiza la relación entre las características arquitectónicas del mercado municipal de Yurimaguas y la calidad del servicio que este ofrece a la población. A partir de un enfoque cuantitativo, se aplicó una encuesta estructurada a 138 ciudadanos, cuyos resultados evidenciaron una percepción mayoritariamente negativa respecto a la funcionalidad, accesibilidad y organización del mercado. La prueba estadística Tau-b de Kendall reveló una correlación positiva y significativa entre las condiciones arquitectónicas del equipamiento y la percepción de calidad del servicio. En base a estos hallazgos, se elaboró una propuesta arquitectónica que reorganiza el mercado mediante una zonificación funcional diferenciada, mejoras en los sistemas de circulación, accesibilidad universal y servicios complementarios. Esta propuesta busca optimizar la experiencia del usuario y responder a las deficiencias estructurales identificadas, alineándose con estándares normativos vigentes. La investigación demuestra que una adecuada planificación arquitectónica no solo impacta en el desempeño operativo del mercado, sino que también mejora la percepción ciudadana del servicio, contribuye a la revalorización del espacio público y fortalece la economía local. Los resultados obtenidos pueden servir como base para futuras intervenciones en otros mercados de la región amazónica del Perú, promoviendo un modelo de desarrollo urbano más sostenible e inclusivo.

Palabras clave: accesibilidad; arquitectura; mercado; planificación urbana; servicios públicos



1. INTRODUCTION

Food markets play an essential role in urban planning and food distribution in cities around the world (Odeyale, 2020). In countries such as Spain, France, and the Netherlands, these spaces have undergone architectural interventions aimed at optimizing functionality and improving the user experience (Blečić et al., 2024; Yu et al., 2025). Strategies such as efficient spatial zoning, the use of sustainable materials, and bioclimatic design have been implemented in benchmark markets (Hafez et al., 2023), including La Boquería in Barcelona and Rungis Market in France, enabling better use of the urban environment and reducing environmental impacts (Amdaoud et al., 2022; Crespi-Vallbona & Dimitrovski, 2017).

In Latin America, the modernization of food markets has focused on integrating accessibility criteria, energy efficiency, and optimization of commercial space (Lizarzaburu Bolaños et al., 2015). In cities such as Quito and Bogotá, local governments have implemented rehabilitation projects that include improvements to storage areas, cross-ventilation systems to enhance air quality, and solid waste management systems (Espinosa-Aquino et al., 2023). These interventions have shown that appropriate architectural planning not only improves market functionality but also influences users' perceptions of service quality.

In the Peruvian context, food markets constitute the main food distribution channel for the population and play a key role in food security and the local economy (Rodríguez-Lozada et al., 2024). However, many of these establishments present deficiencies in infrastructure and organization due to a lack of architectural planning and specific regulations. Problems such as inadequate zoning of commercial areas, insufficient ventilation and drainage systems, and overcrowding of vendors affect the operation of these spaces (Vargas-Cuervo et al., 2024). Evidence has shown that the obsolescence of traditional markets compromises service quality and the sustainability of commercial activity, making their modernization imperative through functional and accessible design criteria.

In the Loreto Region, the city of Yurimaguas has a municipal market that, despite its importance as a supply center, faces serious deficiencies in infrastructure and organization. This market, which serves as the main commercial distribution point for the urban and rural population of Alto Amazonas Province, has not undergone significant improvements for decades, resulting in the progressive deterioration of its facilities. The lack of adequate storage areas, insufficient ventilation, poor spatial distribution, and informal occupation of public roads have created a disorderly environment that affects both vendors and consumers.

The central problem lies in the fact that the current architectural characteristics of the Yurimaguas Municipal Market do not ensure high-quality service for the population. Congestion at access points, deficient sanitary infrastructure, and the lack of an appropriate design for circulation and product distribution have contributed to an unsatisfactory shopping experience. In addition, the absence of adequate commercial spaces has encouraged the proliferation of informal trade in the surrounding areas, generating urban disorder and health risks. This situation highlights the need to analyze and improve the architectural aspects of the market in order to optimize its functionality and provide better service to the community.

The justification for this research lies in the importance of food markets as pillars of local commerce and in their impact on the population's quality of life (Guzmán-Pérez et al., 2021). Appropriate architectural design not only improves the functionality and safety of the market but also contributes to the organization of public space, reduces levels of informality, and strengthens regional economic activity (Mandeli, 2019; Qi et al., 2024). Furthermore, this research may serve as a basis for future modernization initiatives in other markets of the Peruvian Amazon, promoting sustainable urban development.

In this context, the objective of the study was to determine the architectural characteristics of the Yurimaguas food market and their influence on the quality of service provided to the population. To this

end, the current market infrastructure and users' perceptions of the service provided were analyzed, and the relationship between these aspects was identified. Based on the findings obtained, an architectural design was proposed to optimize market functionality and ensure a better user experience.

2. MATERIALS AND METHODS

Research design

The study followed a quantitative approach with a non-experimental, cross-sectional, and correlational design. This design was selected because no variables were manipulated; instead, the architectural characteristics of the Yurimaguas Municipal Market and their relationship with the service quality perceived by users were analyzed at a single point in time.

Population and sample

The study population consisted of residents of Yurimaguas who use the municipal market to purchase essential goods. A representative sample of 138 participants was calculated using simple random probability sampling. The sample size was determined considering a 95% confidence level, a 5% margin of error, and an expected proportion of 50% positive responses in the surveys.

Study variables

Two main variables were established in the study. The independent variable corresponded to the architectural characteristics of the food market, evaluating aspects such as spatial distribution, accessibility, ventilation, lighting, and structural conditions. The dependent variable was the service quality perceived by users, measured through indicators of comfort, operational efficiency, and overall satisfaction with the market infrastructure.

Data collection instruments and techniques

A structured questionnaire with closed-ended Likert-type questions was designed for data collection, with response options on a four-level scale: "Strongly agree," "Agree," "Disagree," and "Strongly disagree." The instrument was divided into two sections: the first measured the architectural characteristics of the market in dimensions such as structural design, zoning, and accessibility; the second assessed service quality based on users' perceptions of the comfort and functionality of the facilities.

The validity of the questionnaire was determined through expert judgment involving three architects and two urban planning specialists. As a result of this evaluation, a Content Validity Index (CVI) of 0.92 was obtained, indicating a high level of relevance and adequacy of the instrument. The reliability of the questionnaire was assessed using Cronbach's alpha coefficient, obtaining a value of 0.87, which reflects a high level of internal consistency in the measurements.

Research procedure

The research was conducted in several stages. Initially, a documentary review of architectural regulations applicable to food markets was carried out in order to establish the evaluation criteria for the study. Subsequently, surveys were administered to the selected sample following a structured protocol to ensure uniformity in data collection.

The collected data were processed using IBM SPSS Statistics v26. First, a descriptive analysis was performed to evaluate the frequency and distribution of responses for each variable. Subsequently, inferential analysis was conducted using Kendall's Tau-b correlation test to determine the existence and strength of the relationship between the market's architectural characteristics and the service quality perceived by users.

Ethical considerations

The study was conducted in accordance with the fundamental ethical principles of scientific research. Participant autonomy was guaranteed by ensuring their right to decide whether to take part in the survey. The principle of confidentiality was observed by protecting respondents' identities and ensuring that the collected data were used exclusively for academic purposes. Beneficence was also promoted by seeking to ensure that the study findings contributed to improving the conditions of the municipal market and, consequently, the well-being of the community. Finally, the principle of justice was ensured by guaranteeing equitable participant selection and preventing the unjustified exclusion of any population group.

3. RESULTS AND DISCUSSION

This section presents in detail the findings obtained from the study conducted with 138 residents of the city of Yurimaguas, who evaluated the architectural conditions of the Municipal Food Market and their impact on the quality of the service provided. The results are organized according to the specific objectives and include both descriptive and inferential statistical analyses, supported by previous studies addressing similar issues in urban food markets.

3.1 Evaluation of the architectural characteristics of the Yurimaguas Municipal Market

The results showed that a substantial majority of respondents (80%) considered the architectural characteristics of the current Yurimaguas market to be “not at all adequate” for carrying out commercial activities (Table 1). This finding is reinforced by the percentage distribution of the dimensions evaluated: 72% reported deficiencies in the architectural aspect and 57% in the urban context, indicating a generalized lack of functional design, integration with the surrounding environment, comfort conditions, and suitability for intensive daily use.

Table 1. Evaluation of the architectural characteristics of the Yurimaguas market

Rating scale		Architectural characteristics	Architectural aspect	Urban context
Not at all adequate	No.	110	100	78
	%	80%	72%	57%
Slightly adequate	No.	28	38	51
	%	20%	28%	37%
Adequate	No.	0	0	9
	%	0%	0%	6%
Total	No.	138	138	138
	%	100%	100%	100%

These results are consistent with the findings of Celi Carrasco (2018), who identified that the lack of ventilation, lighting, and planning in the Gonzanamá market (Ecuador) compromised not only the functionality of the space but also the sanitary conditions of the commercial environment. Likewise, Molina Gallegos (2018) proposed that spatial reorganization in markets should include specialized zones for wet, dry, and semi-wet activities, as well as administrative support areas, in order to optimize circulation, order, and hygiene conditions.

3.2 Assessment of service quality

Regarding the perceived quality of service provided in the municipal market, the results were conclusive: 99% of respondents rated the service as “poor,” while only 1% considered it “fair,” and none rated it as

“good” (Table 2). These results reflect a serious functional crisis in terms of customer service, sanitary conditions, product organization, and environmental conditions.

Table 2. Level of service quality in the Yurimaguas market

Service quality	No. of respondents	% of respondents
Poor	136	99%
Fair	2	1%
Good	0	0%
Total	138	100%

When the results were analyzed by dimension, service evaluation and impact emerged as one of the most critical areas, with 96% of respondents perceiving this dimension as deficient. This negative assessment reveals a lack of organization and control in market management, generating a deteriorated institutional image at both functional and symbolic levels. Conditions reported by users included disorder, limited supervision of perishable products, and the improvised arrangement of sales stalls, all of which directly affect the consumer experience and the overall perception of service quality.

With regard to the infrastructure dimension, the results were even more conclusive: 98% of surveyed residents rated this dimension as inadequate. The reported situation included serious structural problems such as cracked floors, rusted roofs, and a general state of deterioration that places both vendors and customers at risk. These precarious conditions, combined with the absence of functional spaces, drinking-water points, and safe electrical installations, confirm that the market has exceeded its useful life without receiving structural intervention consistent with current demands. In addition to affecting daily operations, these deficiencies discourage the use of formal commercial space and encourage the expansion of informal trade in the surrounding areas.

Finally, the accessibility dimension also revealed concerning results: 37% of respondents considered access to the market poor, while 63% rated it as fair. These figures reflect compromised pedestrian and vehicular circulation, characterized by the occupation of public space by informal vendors, congestion at access points, and the absence of appropriate signage and road infrastructure. Limited urban planning in the immediate surroundings and insufficient loading and unloading areas negatively affect both product deliveries and user mobility. Thus, deficient accessibility not only hinders commercial flows but also contributes to perceptions of insecurity and urban disorder among Yurimaguas residents.

3.3 Relationship between architectural characteristics and service quality

To analyze the relationship between the study variables, the Kolmogorov–Smirnov normality test was initially applied. The test revealed a non-normal distribution of the data ($p < 0.05$); therefore, the non-parametric Kendall’s Tau-b test was used.

The results showed a correlation coefficient of 0.429, with a two-tailed significance level of $p = 0.000$, indicating a direct, statistically significant, and moderate relationship between the market’s architectural characteristics and service quality (Table 3).

Table 3. Kendall’s Tau-b correlation between architectural characteristics and service quality

	Kendall’s Tau-b	Calidad de servicio
Architectural characteristics	Correlation coefficient	.429**
	Coefficient of determination	18.4%
	Sig. (2-tailed)	.000
	No.	138

The results obtained using Kendall’s Tau-b test showed a positive and statistically significant correlation between the market’s architectural characteristics and the service quality perceived by users, with a correlation coefficient of 0.429 and a significance level of 0.000. This moderate relationship indicates that

improvements in the market's architectural conditions are likely to be accompanied by improvements in perceived service quality.

The coefficient of determination, equivalent to 18.4%, suggests that nearly one-fifth of the variation in perceived service quality may be directly attributed to the physical and functional conditions of the architectural space. This implies that factors such as spatial distribution, infrastructure condition, ventilation, lighting, and accessibility have a tangible effect on user satisfaction and the operational efficiency of the commercial environment.

These findings reinforce the idea that public spaces intended for commercial activity require not only an adequate physical structure but also comprehensive planning that considers the user experience. Deficient architecture limits not only comfort and functionality but also weakens community confidence in the institutional quality of the service provided. Therefore, architectural interventions in these spaces may have a direct and measurable impact on improving commercial management and citizens' perceptions of service quality.

3.4 Hypothesis validation

The grouped data presented in Table 4 show that 79% of respondents simultaneously indicated that service quality was poor and that the architectural characteristics were "not at all adequate," while 19% associated poor service quality with "slightly adequate" architectural characteristics. These results support acceptance of the alternative hypothesis and rejection of the null hypothesis, confirming a positive relationship between improved architectural conditions and higher perceived service quality.

Table 4. Cross-tabulation of architectural characteristics and service quality

Architectural characteristics	Service quality		Overall total
	Poor	Fair	
Not at all adequate	109	1	110
Slightly adequate	27	1	28
Overall total	136	2	138
Características arquitectónicas	Service quality		Overall total
	Poor	Fair	
Not at all adequate	79%	1%	80%
Slightly adequate	19%	1%	20%
Overall total	98%	2%	100%

4.5 Architectural proposal derived from the study

Based on the diagnosis, an architectural proposal was developed to directly address the deficiencies identified in the Yurimaguas Municipal Market, particularly those related to functionality, accessibility, sanitary conditions, and spatial organization. The design is based on the principle of differentiated zoning according to the type of commercial activity, thereby optimizing internal circulation flows and ensuring more orderly and safer operation of the facility.

The proposal establishes specific zones for wet, dry, and semi-wet activities, ensuring appropriate conditions for product handling and preservation. It also incorporates a food court designed to accommodate large numbers of users throughout the day. In addition, the proposal includes spaces for complementary services such as banks, childcare facilities, breastfeeding rooms, a first-aid station, administrative offices, a mechanical room, maintenance areas, storage facilities, cold-storage rooms, and separate sanitary facilities for users and workers.

The spatial organization complies with regulatory parameters related to occupancy capacity, minimum area per stall, and functional requirements, taking into account projected demand estimates based on the population within the market's area of influence. The architectural proposal not only reorganizes the

existing space but also transforms the market into a more efficient, safe, and dignified environment that promotes better conditions for commercial activity and public service.

Likewise, the design considers the integration of the market with its urban surroundings through hierarchically organized entrances, differentiated loading and unloading areas, clear signage, wide pedestrian walkways, integrated green spaces, and universal accessibility. This not only improves the facility's daily operation but also enhances the user experience by reducing overcrowding, disorder, and unsanitary conditions, while strengthening the market's role as a functional and well-structured public space.

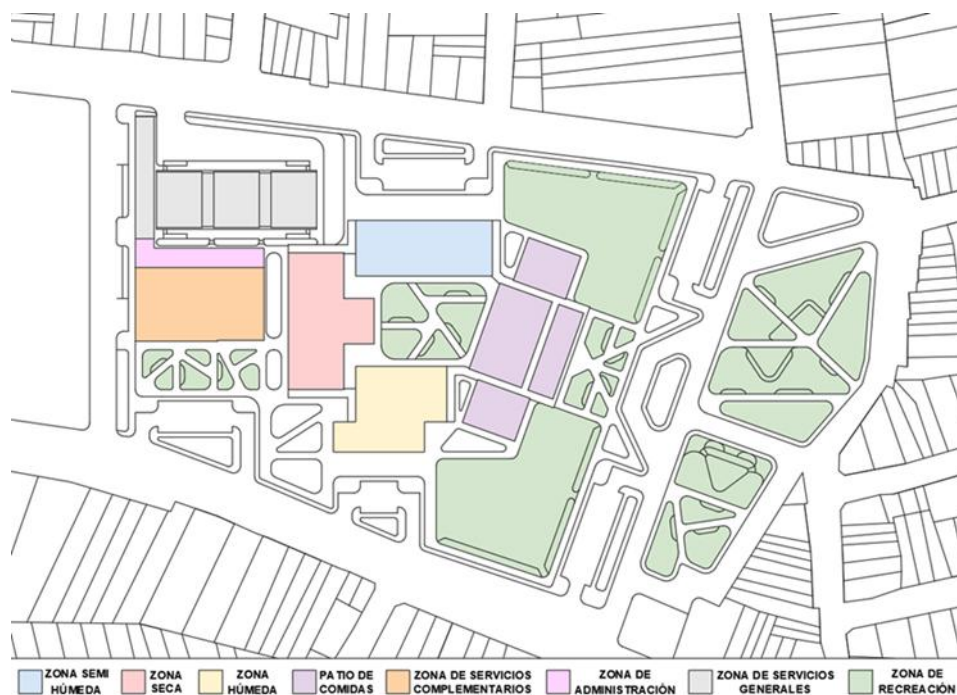


Figure 1. Proposed functional zoning for the new Yurimaguas Municipal Market

The image represents the proposed distribution of commercial, administrative, complementary service, and recreational areas, organized to improve functionality and service quality within the market.

The results of this study reinforce the fundamental role that food markets play within the urban fabric and in the quality of life of communities. As Berkhout et al. (2023) and Xara-Brasil et al. (2024) point out, these spaces must not only ensure efficient food distribution but also comply with architectural standards that promote functionality, hygiene, accessibility, and sustainability. In this regard, the conditions identified in the Yurimaguas Municipal Market, characterized by obsolete infrastructure and inadequate organization, reveal a significant gap compared with international trends that promote efficient zoning, adequate ventilation, and user-centered design (Hafez et al., 2023; Yu et al., 2025).

The experience of market modernization in Latin American cities such as Quito and Bogotá shows that well-planned rehabilitation processes not only improve infrastructure but also have a direct effect on users' perceptions of service quality (Espinosa-Aquino et al., 2023). In Yurimaguas, the perceptions collected in this study indicate strong dissatisfaction with service quality, particularly regarding deficient zoning and sanitary limitations. This is consistent with Vargas-Cuervo et al. (2024), who warn that the lack of architectural planning in traditional markets compromises both functionality and the sustainability of commercial activity. Therefore, the proposed design seeks not only to improve the physical environment but also to enhance the user experience through a logical distribution of spaces, complementary services, and appropriate circulation conditions.

Finally, the proposed architectural intervention can be understood as a concrete response to a structural problem that recurs in multiple contexts throughout the country. In Yurimaguas, where the municipal market constitutes a central hub for both the urban and rural economy, an intervention based on functional, accessible, and regulatory-compliant design criteria is both urgent and necessary. As highlighted by Rodríguez-Lozada et al. (2024) and Guzmán-Pérez et al. (2021), improving the physical conditions of markets involves not only renovating infrastructure but also strengthening local commerce, reducing informality, and revitalizing public space. Accordingly, the findings of this study provide a basis for similar future interventions in other markets across the Peruvian Amazon, contributing to a more equitable and sustainable model of urban development.

CONCLUSIONS

The findings of this study indicate that the architectural characteristics of the Yurimaguas Municipal Market have a significant influence on the quality of service perceived by users. The empirical evidence collected shows that most residents consider the market's physical conditions to be inadequate, both in terms of spatial distribution and basic functional aspects such as ventilation, accessibility, and internal organization. This negative perception is directly associated with the obsolescence of the existing infrastructure, the lack of specialized zoning by product type, and the insufficiency of complementary services, all of which negatively affect the shopping experience, the market's operational efficiency, and the image of the surrounding urban environment.

In this context, the proposed architectural design constitutes a comprehensive response to the identified deficiencies, focusing on improving the functionality of the facility through a more efficient, accessible, and appropriately organized spatial layout that responds to the current needs of vendors and users. This intervention not only represents a technical and regulatory solution but also contributes to strengthening the role of the market as a strategic space for food supply, social cohesion, and the local economy. In addition, the proposed design may be considered a replicable model for the modernization of other markets in the Amazon region, contributing to the development of more orderly, inclusive, and sustainable cities.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to the subject matter of this study.

AUTHOR CONTRIBUTIONS

Conceptualization, data curation, formal analysis, investigation, methodology, visualization, writing – original draft, and writing – review and editing: Maura Luz Pinedo-Ubilluz, Claudia Raquel Pinedo-Vela, and Camilo Barragán-Morales.

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