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Research on the Impact of the Opening of the East-West Intercity Rail in the Guangdong-Hong Kong-Macao Greater Bay Area on Regional Tourism

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Abstract: The opening of the Guangdong-Hong Kong-Macao Greater Bay Area East-West Intercity Rail has significantly impacted tourism in cities along its route. This study integrates data from 303 valid questionnaires to analyze the correlation mechanisms between transportation accessibility, tourist demand, visitor satisfaction, and regional tourism impacts. The results reveal a moderately strong linear relationship (R=0.545) between "transportation accessibility" and "regional tourism impact"—a 1-unit improvement in accessibility leads to an average 0.681 increase in regional tourism impact, demonstrating strong effects on economic growth and low-carbon emissions. Transportation accessibility significantly enhances overall satisfaction, with each 1-unit improvement increasing it by 0.697. Regional tourism impact also positively influences both visitor behavior and overall satisfaction. The research indicates that this rail project has boosted tourist traffic in coastal cities and acc elerated the development of the Greater Bay Area as a premier tourism destination. Based on these findings, recommendations are proposed to optimize infrastructure layouts and improve service quality, aiming to transform transportation advantages into tourism economic benefits.

Keywords: Regional tourism; East-West Intercity Rail in Guangdong-Hong Kong-Macao Greater Bay Area; Light rail transit; Tourism impact.

1. Introduction

As the core carrier of China's "world-class urban agglomeration" and "international science and technology innovation center", the Guangdong-Hong Kong-Macao Greater Bay Area has formed a differentiated pattern of "strong sci-tech innovation services on the east bank and special manufacturing and cultural tourism on the west bank" due to the geographical separation of the Pearl River Estuary. The transportation shortcomings have constrained industrial coordination and factor flow between the east and west banks. To break through this development bottleneck, since the launch of the "Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area" in 2019 to build the backbone rail transit network, and until the official implementation of the "Implementation Plan for Promoting the 'Four Network Integration' Development of Rail Transit in the Guangdong-Hong Kong-Macao Greater Bay Area" by the National Railway Administration in 2024, the integration of intercity railways, regional railways, urban rail transit, and high-speed rail networks has been achieved. Through the Guangfo South Ring, Foshan-Dongguan Intercity, and the existing Foshan-Zhaoqing and Dongguan-Huizhou Intercity, a 258-kilometer east-west intercity rail network in the Greater Bay Area has been constructed, realizing direct connectivity among the five cities of Huizhou, Dongguan, Guangzhou, Foshan, and Zhaoqing.

The full operation of the East-West Intercity Rail in the Guangdong-Hong Kong-Macao Greater Bay Area has transformed regional tourism patterns, triggering a surge in passenger traffic along the route and giving rise to the "Bay Area Weekend Tour" phenomenon. Against this backdrop, systematic research on the impact of the rail's launch on regional tourism, as well as exploring the "railway + tourism" integration model in the Greater Bay Area, holds significant importance for achieving sustainable development of all-for-one tourism.

This study examines the development of the East-West Intercity Rail Network in the Guangdong-Hong Kong-Macao Greater Bay Area, employing empirical analysis of core variables including transportation accessibility, tourist demand, visitor satisfaction, overall satisfaction, and regional tourism impacts. It investigates the mechanisms through which the rail network's operation enhances regional tourism, demonstrating how improved connectivity stimulates travel intentions. By integrating tourist needs, the research evaluates how enhanced rail efficiency influences cross-city travel decisions along the route. The study further analyzes how the network facilitates cross-regional integration of cultural and tourism resources, driving innovation in "transportation + tourism" products. Based on empirical findings, targeted strategies are proposed to optimize the East-West Intercity Rail Network and promote coordinated regional tourism development.

2. Literature Review

2.1. Regional Tourism

The concept of "regional tourism" was first proposed in the mid-1980s. Li Mingde (1993) further refined this concept in the 1990s, emphasizing a multidimensional approach to regional tourism that includes complementary tourism resource advantages, holistic cultural marketing, enhanced scale efficiency, strengthened regional competitiveness, and community economic-cultural progress [1]. In international research, Hua H and Wondirad A (2020) introduced network relationships into urban agglomeration tourism system studies, proposing that resource integration drives regional sustainable development [2]. Diem-Trinh Le-Klahn et al. (2015) demonstrated that tourists' transportation mode

choices and regional visit decisions are influenced by residential areas, duration of stay, travel experiences, perceived convenience, and attraction appeal [3]. Kim Hyunjung and Kim Eun Jung (2021) confirmed that information dissemination, transportation optimization, and spatial layout significantly positively impact tourist growth in tourism regions [4].

Chinese scholar Xia Lan (2016) analyzed that the economic performance of regional tourism industries is influenced by a combination of environmental, economic, policy, and tourism development factors [5]. Feng Wanyi et al. (2024), using the Yangtze River Delta as a case study, demonstrated how tourism cooperation fosters regional tourism integration and symbiosis [6]. Mao Lijuan et al. (2024) emphasized that regional tourism integration serves as a key pathway to promote harmonious economic development, showing a positive correlation with economic growth [7].

2.2. East-West Intercity Rail in the Guangdong-Hong Kong-Macao Greater Bay Area

The Guangdong-Hong Kong-Macao Greater Bay Area intercity rail network, with Guangzhou as its hub, aims to establish a "one-hour urban rail transit zone." The east-west rail corridor significantly accelerates this initiative. Through its "large station express" service, the east-west rail connects Guangzhou to Foshan and Dongguan centers within 30 minutes, and to Zhaoqing, Huizhou, and other cities within 60 minutes, forming a transportation network that "radiates from core cities and links surrounding areas" [8]. This network not only reduces intercity commuting time but also facilitates cross-regional flows of economy, culture, and talent.

Transportation serves as a vital pillar for tourism development. Scholars such as Wang Jianxi (2010) and Chen Yongsheng (2015) have highlighted that rail transit must be integrated with other transportation modes to enhance regional tourism appeal, while a rational fare mechanism is crucial for stimulating high-speed rail tourism demand [9][10]. Li Tao et al. (2019) underscored the pivotal role of intercity rail networks in the coordinated development of the Pearl River Delta [11]. Li Ruyou and Huang Changzhou (2015) posited that transportation, as a conduit for tourism elements, influences the flow of capital, materials, and information, as well as the location choices of tourism enterprises, thereby driving the evolution of regional tourism patterns [12].

In empirical research, Xun Ziwei (2021) found that the Lanzhou-Xinjiang High-Speed Railway significantly boosts tourism in major and medium-sized cities along its route, while smaller cities show weaker effects due to the siphon effect [13]. Yuan Jiade and Tan Peipei (2023) confirmed that transportation infrastructure construction has spatial spillover effects, indirectly influencing tourism development in neighboring provinces [14]. Guo Xiangyang et al. (2021), using Yunnan as a case study, emphasized the need to consider spatial effects when evaluating the relationship between transportation services and tourism efficiency [15]. Based on transportation accessibility theory and regional tourism integration theory, combined with the functional characteristics of the Guangdong-Hong Kong-Macao Greater Bay Area's east-west intercity rail and existing research findings, the following research hypotheses are proposed regarding the causal relationships between core variables:

H1: Transportation accessibility has a significant positive impact on regional tourism;

H2: Regional tourism has a significant positive impact on tourist satisfaction;

H3: Regional tourism has a significant positive impact on overall satisfaction.

3. Research Methods

The study employed a 7-point Likert scale questionnaire with 20 items covering transportation accessibility, tourist needs, visitor satisfaction, overall satisfaction, and regional tourism impact to comprehensively assess respondents 'perceptions and evaluations of the intercity rail service launch. Data collection utilized both online (WeChat Moments, Xiaohongshu) and offline channels, yielding 303 valid responses. SPSS software was applied for data cleaning, coding, and reliability analysis (Cronbach's $\alpha = 0.877$), validity analysis (KMO = 0.891, Bartlett's test for sphericity significant), and regression analysis to investigate inter-variable relationships.

4. Data Analysis

4.1. Descriptive Statistics

(1) Descriptive statistical analysis of the basic information of the questionnaire customers

Demographically, the sample comprised 125 males (41.3%) and 178 females (58.7%), with women constituting a larger proportion, indicating higher female participation. Age distribution showed: 1 individual (0.3%) aged 20 or younger; 111 (36.6%) aged 21-30; 94 (31.0%) aged 31-40; 57 (18.9%) aged 41-50; 30 (9.9%) aged 51-60; and 10 (3.3%) aged 61 or older. The primary demographic clusters were 21-30 and 31-40 years old, reflecting the survey's focus on specific age groups.

In terms of educational background, 14 individuals (4.6%) held junior high school or lower qualifications, while 43 (14.2%) had high school or vocational school education. The most represented group was college graduates (81,26.7%), followed by bachelor's degree holders (114,37.6%) and master's degree holders (51,16.8%). The bachelor's degree group accounted for the highest proportion, indicating strong participation from higher-educated individuals in the sample. Regarding monthly income distribution: 54 respondents (17.8%) earned 3,000 yuan or less, 57 (18.8%) earned 3,000-5,000 yuan, 125 (41.3%) earned 5,000-8,000 yuan, 46 (15.2%) earned 8,000-10,000 yuan, and 21 (6.9%) earned over 10,000 yuan. The 5,000-8,000 yuan income bracket dominated, reflecting the sample's composition as primarily middle-income earners. Regarding marital status, 190 respondents (62.7%) were married, while 113 (37.3%) were unmarried, clearly demonstrating the majority of the sample belonged to the married demographic.

The permanent residence distribution shows the following: 175 individuals (57.8%) in the Pearl River Delta, 33 (10.9%) in western Guangdong, 42 (13.9%) in Chaoshan, 27 (8.9%) in northern Guangdong, and 26 (8.6%) in other regions. Over half of the samples are from the Pearl River Delta, while the remaining are more evenly distributed.

Occupational statistics reveal that 48 individuals (15.8%) work in industrial sectors, indicating a moderate proportion within the overall occupational distribution. Commerce dominates with 78 participants (25.7%), the highest category among all professions, reflecting its largest representation in the sample. Military, public service, and education roles

account for 22 individuals (7.3%), a relatively small proportion likely influenced by the study's sampling scope and target demographics. Agriculture, fisheries, and animal husbandry are represented by 8 individuals (2.6%), the lowest occupational share, possibly due to regional characteristics and industry-specific factors. The service sector leads with 71 participants (23.4%), demonstrating its high coverage in the sample and aligning with the rising prominence of service industries in modern occupational structures. Unemployed individuals (24,7.9%) and students (52,17.2%) indicate the sample's representativeness, with students forming a significant demographic group.

4.2. Reliability Analysis

The Cronbach's Alpha coefficient of the questionnaire data was 0.877. Generally, a Cronbach's Alpha coefficient greater than 0.7 indicates good reliability. The coefficient approaching 1 demonstrates high internal consistency among the variables, indicating strong reliability of the questionnaire.

4.3. Validity Analysis

The validity analysis of the questionnaire data showed that the KMO and Bartlett's test values in factor analysis were 0.891. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) is a statistical measure used to evaluate data suitability. The KMO value ranges from 0 to 1, with higher values indicating greater suitability for factor analysis.

The cumulative% indicates the proportion of variance explained by the top n factors after rotation. For example, if the first 5 factors are extracted and the cumulative variance explained reaches 56.643% after rotation, this means these 5 factors collectively account for over half of the variance in the original variables. A cumulative variance explained of 56.643% demonstrates that these factors effectively capture the information of the original variables.

4.4. Regression Analysis

(1) Regression analysis of traffic accessibility to overall satisfaction

The model summary indicates that an R value of 0.492 demonstrates a moderate linear correlation between "transport accessibility" and "overall satisfaction". The R^2 coefficient of 0.242 indicates that "transport accessibility" accounts for 24.2% of the variance in "overall satisfaction". The adjusted R^2 of 0.240 reflects stable explanatory power. The standard error of estimation (0.60782) measures the average prediction error between the model's output and actual "overall satisfaction" values, with smaller values indicating higher prediction accuracy. The ANOVA table shows an F-value of 96.233 ($p<0.001$), confirming the model's statistical significance. This confirms that "transport accessibility" has a statistically significant impact on "overall satisfaction", rather than being a random factor.

The coefficient of accessibility is 0.697, which is significant, indicating that the overall satisfaction increases by 0.697 per unit increase.

Table 1. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	1.837	.421		4.366	<.001
	Traffic accessibility	.697	.071	.492	9.810	<.001

a. Dependent variable: Overall satisfaction

(2) Regression analysis of the whole satisfaction based on the tourist demand

The model summary indicates an R value of 0.476, demonstrating a moderately strong linear correlation between "tourist demand" and "overall satisfaction". The R^2 coefficient of 0.227 suggests that "tourist demand" accounts for approximately 22.7% of the variance in "overall satisfaction". The adjusted R^2 of 0.224 confirms stable model fit. The standard error of estimation (SEM) of 0.61399 indicates some prediction error, but remains within acceptable limits.

The ANOVA table shows an F-value of 88.292 with a significance level below 0.001, indicating the model is statistically significant. This confirms that 'tourist demand' significantly affects 'overall satisfaction'.

The coefficient table shows a constant term value of 3.732 with a significance level below 0.001. This indicates that without the 'tourist demand' factor, the baseline overall satisfaction score would be approximately 3.732. The tourist demand coefficient is 0.400, meaning each 1-unit increase in 'tourist demand' leads to an average 0.4-point rise in overall satisfaction. With a significance level below 0.001, this demonstrates that higher tourist demand correlates with higher overall satisfaction ratings, confirming the conclusion's statistical significance. See Table 2 for details.

Table 2. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	3.732	.239		15.628	<.001
	Traffic accessibility	.400	.043	.476	9.396	<.001

a. Dependent variable: Overall satisfaction

(3) Regression analysis of the impact of regional tourism on transportation accessibility

The model summary indicates an R value of 0.545, demonstrating a moderately strong linear correlation between "transport accessibility" and "regional tourism impact," suggesting a close relationship between the two. An R^2 of 0.297 indicates that the independent variable "transport accessibility" accounts for 29.7% of the variance in "regional tourism impact." The standard error of estimation (SEM) is 0.51721, reflecting the average deviation between predicted and actual values, which suggests the model has some margin of error but remains analytically valuable. The ANOVA table shows an F-value of 126.909 with a significance level below

0.001, confirming the model's reliability and the genuine impact of "transport accessibility" on "regional tourism impact."

The coefficient table shows a constant term value of 1.749 with a significance level below 0.001. When "transport accessibility" is excluded, the baseline score for "regional tourism impact" remains approximately 1.749, indicating the constant term's strong statistical significance in the model. The transport accessibility coefficient of 0.681 demonstrates that each 1-unit increase in transport accessibility leads to an average 0.681-point increase in regional tourism impact. With a significance level below 0.001, this effect is statistically significant. This confirms that improved transport accessibility significantly enhances regional tourism impact, validating Hypothesis H1. For details, see Table 3.

Table 3. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	1.749	.358		4.886	<.001
	Traffic accessibility	.681	.060	.545	11.265	<.001

a. Dependent variable: The impact of regional tourism

The regression analysis examines the economic dimension of transportation accessibility's impact on regional tourism. The model summary shows an R-squared of 0.456, indicating a significant moderate positive correlation between the two variables. An R-squared of 0.208 suggests that transportation accessibility accounts for approximately 20.8% of the variation in perceived economic growth, with a standard error of 0.784. The ANOVA table reveals an F-value of 79.159 ($p < 0.001$), confirming the model's robustness and demonstrating that transportation accessibility significantly influences perceptions of economic growth.

The coefficient for the constant term is 1.068, with a significance level of 0.05—close to the critical threshold but not reaching statistical significance. The traffic accessibility coefficient is 0.816, meaning each additional unit of accessibility contributes 0.816 to perceived economic growth. The extremely low significance level confirms the robustness of this effect. See Table 4 below for details.

Table 4. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	1.068	.543		1.968	.050
	Traffic accessibility	.816	.092	.456	8.897	<.001

a. Dependent variable: Urban economic growth

The regression analysis of socio-cultural dimensions in the impact of transportation accessibility on regional tourism reveals a weak linear relationship ($R=0.320$) as indicated by the model summary. The adjusted R^2 (0.100) suggests that transportation accessibility accounts for only 10.3% of the variance in cultural communication perception. The standard error of 0.953 indicates a significant discrepancy between model predictions and actual perceptions. The ANOVA results ($F=34.427$, $p<0.001$) confirm the model's validity. In summary, transportation accessibility demonstrates statistically significant influence on cultural communication perception, which is not a random occurrence.

The coefficient value of 1.738 (p-value: 0.009) indicates that 'the baseline perception of cultural dissemination' is affected when transportation accessibility is unavailable. However, this constant term demonstrates limited statistical significance and reliability, suggesting potential errors or uncertainties. The transportation accessibility coefficient of 0.654 suggests that each 1-unit increase in accessibility enhances the perception of 'cultural dissemination through rail transit' by an average of 0.654. With a p-value below 0.001, this effect is statistically significant and not coincidental. See Table 5 below for details.

Table 5. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	1.738	.660		2.634	.009
	Traffic accessibility	.654	.111	.320	5.867	<.001

a. Dependent variable: Urban cultural communication

The regression analysis of the environmental dimension in the impact of transportation accessibility on regional tourism reveals a moderate linear correlation between "transportation accessibility" and the perception that "railway opening reduces carbon emissions," with a model summary R-squared of 0.402. The adjusted R-squared (0.159) indicates that transportation accessibility accounts for approximately 16.1% of the variation in low-carbon emission perception, suggesting moderate but not strong explanatory power. The standard error of estimation is 0.747. The ANOVA table shows an F-value of 57.974 with a significance level below 0.001, confirming the model's overall validity. In summary, transportation accessibility statistically influences the perception that railway opening reduces carbon emissions, demonstrating a non-random effect.

In the coefficient section, the constant term (1.939) demonstrates statistical significance ($p<0.001$), indicating that "the baseline perception of carbon emission reduction is unaffected by transportation accessibility." This constant term

holds strong statistical significance in the model. The transportation accessibility coefficient (0.665) suggests that each 1-unit increase in accessibility enhances the perception of carbon emission reduction by an average of 0.665 units. The significance level ($p<0.001$) underscores its highly significant impact. See Table 6 below for details.

Table 6. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	1.939	.517		3.751	<.001
	Traffic accessibility	.665	.087	.402	7.614	<.001

a. Dependent variable: Environmental dimension

The regression analysis of employment dimensions in the impact of transportation accessibility on regional tourism reveals the following findings: The model summary shows an R-value of 0.345, indicating a moderately low linear correlation between "transportation accessibility" and the perception that "railway opening stimulates economic growth and employment." The R-squared value of 0.119 suggests that "transportation accessibility" only accounts for approximately 11.9% of the variation in "economic growth and employment perception." The adjusted R-squared value of 0.116 indicates moderate explanatory power. The standard estimation error of 0.822 reflects the average discrepancy between model predictions and actual perceptions. The ANOVA table shows an F-value of 40.773 with a significance level below 0.001, confirming the model's overall validity and demonstrating that "transportation accessibility" has a statistically significant impact on the perception that "railway opening stimulates economic growth and employment."

The coefficient analysis reveals a constant term value of 2.142 with a significance level below 0.001, indicating that the baseline perception of "stimulating economic growth and employment" is strongly influenced by "transport accessibility" (reliability rating: high). The transport accessibility coefficient measures 0.614, meaning each 1-unit increase in accessibility correlates with an average 0.614-point rise in perceived benefits. This effect demonstrates statistical significance ($p<0.001$), as detailed in Table 7.

Table 7. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	2.142	.569		3.764	<.001
	Traffic accessibility	.614	.096	.345	6.385	<.001

a. Dependent variable: Employment dimensions

The regression analysis of the consumption dimension in the impact of transportation accessibility on regional tourism reveals the following findings: The model summary shows an R value of 0.348, indicating a moderately low linear correlation between "transportation accessibility" and the perception that "railway opening boosts consumption in cities along the route." An R value of 0.121 suggests that "transportation accessibility" only accounts for approximately 12.1% of the perceived change, indicating limited explanatory power of the model. The standard error of estimation (0.875) reflects the average discrepancy between model predictions and actual perceptions. The ANOVA table shows an F-value of 41.418 with a significance level below 0.001, confirming the model's overall validity. This confirms that "transportation accessibility" has a statistically significant impact on the perception that "railway opening enhances consumption."

In the coefficient section, the constant term value is 1.860 with a significance level of 0.002, indicating a strong baseline perception of 'consumption growth' in the absence of 'transport accessibility,' supported by high reliability. The transport accessibility coefficient is 0.658, meaning each 1-unit increase in transport accessibility correlates with an average 0.658-point rise in perceived consumption. With a significance level below 0.001, this effect is statistically significant. See Table 8 for details.

Table 8. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	1.860	.605		3.071	.002
	Traffic accessibility	.658	.102	.348	6.436	<.001

a. Dependent variable: Consumption dimension

(4) Regression analysis of tourist satisfaction based on regional tourism influence

The model summary indicates an R value of 0.508, demonstrating a moderately strong linear correlation between "regional tourism impact" and "tourist satisfaction," suggesting a clear relationship between the two. The R^2 value of 0.258 indicates that the independent variable "regional tourism impact" accounts for 25.8% of the variance in "tourist satisfaction." The adjusted R^2 value of 0.255, after modifying for sample size and variable quantity, closely matches the original R^2, indicating stable model fit. The standard error of estimation (SEM) is 0.58945, representing the average prediction error between the model's output and actual tourist satisfaction data. In the ANOVA table, the F-value of 104.554 ($p <0.001$) confirms the statistically significant impact of "regional tourism impact" on "tourist satisfaction" in the regression model.

The coefficient table shows a constant term value of 2.787 with a significance level below 0.001. This indicates that when the 'regional tourism influence' is excluded, the baseline score for tourist satisfaction is approximately 2.787, a stable figure. The regional tourism influence coefficient is 0.563, meaning each 1-unit increase in 'regional tourism influence' leads to an average 0.563-point rise in 'tourist satisfaction.' With a significance level below 0.001, this demonstrates a significant impact: stronger regional tourism influence correlates with higher tourist satisfaction, confirming Hypothesis H2. See Table 9 for details.

Table 9. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	2.787	.320		8.721	<.001
	Traffic accessibility	.563	.055	.508	10.225	<.001

a. Dependent variable: Overall satisfaction

(5) Regression analysis of the impact of regional tourism on the overall satisfaction

In the model summary, an R value of 0.432 indicates a moderate linear correlation between "regional tourism influence" and "overall satisfaction", demonstrating a clear trend in their relationship. The R^2 value of 0.186 suggests that "regional tourism influence" only accounts for approximately 18.6% of the variation in "overall satisfaction", indicating that the model's explanatory power remains at a general level, with many factors affecting satisfaction not accounted for in this analysis. The ANOVA table shows an F-value of 68.889 with a significance level below 0.001, confirming that the impact of "regional tourism influence" on "overall satisfaction" is statistically significant rather than arbitrary. In the coefficient table, the constant term value of 3.132 (with significance below 0.001) indicates that if "regional tourism influence" were completely disregarded, the baseline score for overall satisfaction would be approximately 3.132—a reliable figure. The regional tourism influence coefficient of 0.489 means that for every 1-unit increase in "regional tourism influence", "overall satisfaction" increases by an average of 0.489. With a significance level below 0.001, this demonstrates a clear correlation: stronger regional tourism influence correlates with higher overall satisfaction ratings, validating Hypothesis H3. See Table 10 for details.

Table 10. Coefficient

		Nonstandardized coefficient		Standardization coefficient		
Model		B	Standard Error	Beta	t	Sig.
1	Constant	3.132	.342		9.168	<.001
	Traffic accessibility	.489	.059	.432	8.300	<.001

a. Dependent variable: Overall satisfaction

5. Conclusions and Recommendations

5.1. Conclusions

(1) The transportation efficiency demonstrates a significant advantage, while the route coverage and diversified demand require optimization.

Survey analysis indicates that respondents rated "reduced travel time due to the metro's launch" highest (6.42 points), with smart services (QR code boarding and real-time alerts) scoring 6.19 points. This highlights the East-West Intercity Rail's core strengths in bridging spatial-temporal gaps and boosting travel efficiency, making it the most tangible value for tourists. However, the "wide route coverage" score of 5.41 points suggests potential gaps in route planning, particularly in high-demand areas and uneven station distribution, requiring optimized layouts to accommodate diverse travel needs.

Moreover, tourists show strong demand for "railway + attraction combo tickets" (5.65 points), yet demonstrate lower interest in cultural IP co-branded products (5.57 points). This disparity may stem from insufficient promotion or imprecise positioning of cultural products, suggesting that enterprises along the rail routes should prioritize innovative services integrating urban rail transit with tourist attractions, with a focus on developing combo tickets and themed routes. For cultural specialty products, businesses need to conduct precise market assessments, optimize designs by leveraging regional characteristics, and avoid haphazard promotion to enhance the practical outcomes of cultural-tourism integration.

(2) Traffic accessibility significantly drives the comprehensive effect of regional tourism

Empirical analysis reveals a moderately strong linear correlation (R=0.545) between "transport accessibility" and "regional tourism impact", accounting for 29.7% of the total impact variation. By dimension, it demonstrates stronger effects on "economic growth perception" (20.8%) and "low-carbon emission perception" (16.1%), highlighting the dual value of the East-West Urban Rail in stimulating local economies through passenger flow aggregation and reducing carbon emissions via green transportation. In contrast, while "transport accessibility" significantly influences "cultural dissemination", "employment", and "consumption" (10.3%-12.1%), its explanatory power remains limited, indicating that transportation improvements require coordinated efforts with industrial layout and cultural experiences to effectively boost social-cultural and consumption development. Additionally, each 1-unit increase in "transport accessibility" leads to an average 0.697-point rise in "overall satisfaction", demonstrating that enhanced transport efficiency directly impacts tourists' comprehensive evaluation of East-West Urban Rail services.

(3) Characteristics of Tourist Groups and the Mechanism of Satisfaction Transmission.

Demographically, the respondents were predominantly residents of the Pearl River Delta, aged 21-40 (67.6%),

holding bachelor's degrees (37.6%), and earning 5,000-8,000 yuan monthly (41.3% of respondents, 57.8%). This indicates that urban rail transit primarily serves young, middle-income regional travelers. In the satisfaction transmission pathway, "regional tourism influence" accounts for 25.8% of "tourist satisfaction," creating a positive cycle: improved transport accessibility enhances tourism economic and environmental effects, which in turn optimizes tourist experiences and boosts satisfaction. This demonstrates the comprehensive value of urban rail transit in regional development.

5.2. Suggestions

(1) Optimize the layout of the east-west rail network and innovate the tourism consumption scene.

Data analysis revealed that the "wide route coverage" category scored relatively low (5.41 points). To address this, the operational management department and cultural tourism institutions should collaborate to enhance investment in transportation planning. This could involve distributing surveys to collect public feedback on "high-frequency demand areas lacking coverage," followed by conducting research to optimize the alignment between tourist travel hotspots and station coverage.

Capitalizing on tourists' strong demand for "railway + attraction combo tickets" (scoring 5.65 points), East-West Metro operators are partnering with scenic spots, hotels, and travel agencies to launch integrated packages combining transportation, attraction tickets, and accommodation. Examples include the "Greater Bay Area East-West Metro Linkage Pass" and "24-Hour Cross-City Attractions Combo." These packages can be booked online and verified through official apps and travel platforms. To cater to younger travelers, metro-themed routes like intangible cultural heritage tours and coastal sightseeing routes are being designed, complemented by shuttle buses connecting metro stations to attractions, enhancing the "travel-as-tourism" experience.

Data analysis revealed low consumer interest (5.57 points) in "cultural IP co-branded products." To address this, the study recommends investigating tourists' consumption preferences for cultural specialties in cities along the route, focusing on portable products with Greater Bay Area characteristics (e.g., Guangzhou embroidery, lion dance-themed cultural and creative items, Hong Kong-style tea snacks gift boxes) to avoid homogenization. For promotional channels, customized campaigns should leverage LED screens at urban rail transit stations and official social media platforms, tailored to route themes (e.g., routes passing through historic and cultural cities).

(2) Focus on the needs of target customers and improve the level of operational service refinement.

Targeting the 21-40 age group (67.6% of the population) with middle incomes in the Pearl River Delta, the East-West Urban Railways enhance intelligent and convenient services. Key upgrades include optimized QR code boarding technology, real-time passenger flow monitoring, and congestion alerts to meet young travelers 'demands for efficiency and transparency. Ticketing innovations like the "Weekly/Monthly Commute Pass" and "Inter-city Tourism Subcard" align with middle-income consumers' spending habits, boosting user retention.

The data indicates that "operational satisfaction" (5.97 points) and "recommendation willingness" (5.93 points) scores are notably high. Urban rail operators should establish a regular visitor feedback mechanism (e.g., in-app satisfaction surveys, station suggestion boxes) to monitor key metrics like service frequency, carriage capacity, and punctuality rates for East and West Rail lines, thereby maintaining or improving these scores. During peak hours (e.g., weekends and holidays), operators should dynamically adjust schedules, using big data to predict passenger flow on popular routes and implement preemptive crowd management to reduce experience degradation caused by overcrowding or excessive waiting times. Additionally, optimizing onboard facilities (e.g., charging ports, seating arrangements) and enhancing service details will help solidify the reputation of efficient and comfortable urban rail services.

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