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RESEARCH ARTICLE

Modeling the Influence of Cultural Graphics on Urban Perception in Qinzhou City: A Structural Equation Approach

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ABSTRACT

This research examines the crucial requirement to incorporate cultural aspects into urban design, especially in Qinzhou, China's smaller urban environment, by studying cultural graphics' impact on urban perceptibility. The study examines cultural graphics' influence on urban perception by studying how cultural and social identity results in changes to urban perception while personal values and beliefs and media consumption serve as intervening factors. Data collection involved 425 valid responses in Qinzhou City through a quantitative research design, which allowed Structural Equation Modeling (SEM) to analyze the relationships. The evaluation reveals cultural graphics create substantial effects on urban perception through direct pathways as well as indirect routes powered by personal values and media consumption. Urban planning authorities need to make cultural graphics an integral part of city development to develop stronger cultural identities and community attachments. Urban planners should encourage the integration of cultural graphics in urban development to protect heritage elements while fulfilling contemporary development requirements, which will generate more inclusive public spaces.

Contribution/Originality: This study contributes to the existing literature by quantitatively analyzing the impact of cultural graphics on urban perception in Qinzhou City. The research employs SEM to identify how personal values and media consumption act as mediators in understanding urban identity development with new findings about planning practices in emerging cities.

1. Introduction

Urban areas worldwide face rapid development, with cities using cultural components as key elements for urban design to generate distinctive urban identity and cultural expression. The urban expression of a city's heritage and values depends heavily on

cultural graphics which include murals and signage together with motifs and architectural designs. Public spaces benefit from visual elements which serve three essential functions in the development of urban identity while adding beauty and forming bonds between residents. The recognition of cultural graphics as urban space enhancers exist, but researchers need to study better how they affect the way residents perceive cities, especially in smaller populations.

Research into cultural graphics provides mainly qualitative findings despite lacking quantitative analysis about the direct effects on urban perception. Research lacks empirical evidence which explains how residents' perceptions of their city are shaped by cultural graphics that reflect cultural and social identities. The rapid urban development underway in Qinzhou city creation requires careful integration of cultural visual elements within urban environments. Since social identity and personal values join cultural identity in shaping how residents interpret urban graphics, this aspect remains poorly researched in this setting.

The growing cities such as Qinzhou present urban planners with the vital task of creating equilibrium between present-day development and cultural heritage protection. The ability of cultural graphics to express local narratives and traditional heritage is gaining recognition, but urban planners and cultural institutions need concrete empirical standards for their appropriate implementation. Urban designers who study the points where cultural identity and social identity meet urban perception will discover useful knowledge to develop public areas that appeal to both residents and visitors and support investor attraction.

The research investigates how cultural graphics affect urban perception throughout Qinzhou City to address this existing knowledge gap. The research examines how cultural identity social identity, and individual values shape residents' perceptions of urban spaces. The analysis of cultural graphics' effects on urban perception will strengthen urban knowledge while providing implementation guidance for adding cultural components to urban development processes.

1.1. Research Objectives

RO1: To determine the effect of cultural graphics strategy through cultural identity on urban space perception in Qinzhou City.

RO2: To examine the effect of cultural graphics strategy through social identity on urban space perception in Qinzhou City.

RO3: To investigate the mediating effect of personal values and beliefs on the relationship between cultural graphics and urban space perception in Qinzhou City.

RO4: To explore the mediating effect of media consumption on the relationship between cultural graphics and urban space perception in Qinzhou City.

1.2. Hypotheses

H1: Cultural graphics strategy through cultural identity has a positive and significant effect on the urban space perception in Qinzhou City.

H2: Cultural graphics strategy through social identity has a positive and significant effect on the urban space perception in Qinzhou City.

H3: Personal values and beliefs mediates the relationship between cultural graphics and the urban space perception in Qinzhou City.

H4: Media consumption mediates the relationship between cultural graphics and the urban space perception in Qinzhou City.

2. Literature Review

2.1. The Role of Cultural Graphics in Urban Perception and Identity

Urban identity takes shape through public artworks such as murals, sculptures, signage, and other forms of public art. Cities use visual installations as tools to share their historical records, cultural traditions, and essential principles which directly shape urban perception among residents and tourists. Research demonstrates community murals and public artworks function as identity expression tools that build local pride and create neighborhood unity (Ali, 2022; Sieber et al., 2012). Through murals and public art displays, communities develop symbols of opposition that enable residents to retake control of their stories while combating outsider biases.

Cultural graphics serve two essential functions: first, they create cultural identity, and second, they improve the visual appeal of urban spaces. Urban areas become more appealing to residents when these components are integrated into architectural structures, which create beautiful views and attract attention. Participatory art projects that allow local communities to help make graphics strengthen residents' sense of ownership and pride in the outcome. The Mural Arts Program in Philadelphia demonstrates through public art how community involvement develops neighborhood responsibility while protecting traditional customs (Kennedy, 2021). Implementing cultural graphics serves dual functions by creating visually appealing urban environments while generating stronger social ties among residents, leading to community cohesion.

2.2. Visual Culture Theory and the Emotional Impact of Cultural Graphics

Through Visual Culture Theory, we can study how cultural graphics influence the way people perceive urban environments. According to this theoretical framework, visual components, including images, symbols, and designs in public settings, hold meaningful messages that influence how people understand their surroundings. Sustainable urban design achieves emotional and cognitive engagement through its integration of culturally meaningful graphics. Cultural graphics utilize symbolism to show historical elements and regional identity to develop emotional landscapes that govern how people emotionally interact with their urban environment.

Previous research indicates that cultural graphics create pride and nostalgia, which fosters feelings of belonging within the resident population (Fathullah & Willis, 2018). When cultural narratives are depicted in murals and sculptures such systems create intense positive emotional reactions which both strengthen place attachment with the neighborhood and foster city pride. Emotional engagement between residents and their city increases when they experience urban spaces, which leads to stronger attachments

between residents and their city. Urban design needs local identity and heritage elements because cultural graphics create emotional perceptions that strengthen the city's social connections (Li et al., 2015).

2.3. Factors Influencing Urban Perception: Aesthetic and Cultural Contexts

The formation of urban perception results from multiple elements that combine both aesthetic features and cultural influences. The emotional and cognitive connection people have to their environment depends heavily on the visual aspects of their urban spaces, including color schemes, forms, and design principles. The design quality of building facades, together with spatial arrangement, influences how people rate urban scenery and their perception of city livability (Kim, 2017; Knez & Thorsson, 2006). Urban spaces become crucial to understanding when we consider their layout and how accessible they are. The way spaces are designed for easy navigation creates comfortable accessible areas, yet poorly designed spaces may produce feelings of alienation (Brkljac et al., 2016).

Urban perception depends heavily on the cultural framework. Urban spaces carry embedded symbols that act as representations of their cultural heritage and historical value. The symbolic elements of urban spaces shape resident attachments to their environment and participate in the creation of collective urban identities. Visual markers of cultural identity emerge through cultural graphics that reflect local traditions, thereby increasing space emotional resonance (Düzenli et al., 2019; Kulözü-Uzunboy, 2021). The way people perceive urban areas depends on the social characteristics of their environments as well as how residents understand them. Research on urban perception requires examination of both historical perspectives alongside social contexts because individuals use their cultural background and life experiences to understand their city environment (Borer, 2006; Dembski & Salet, 2010).

2.4. Methodologies for Analyzing Cultural Graphics and Urban Perception

Quantitative and qualitative research methods are routinely used in research on cultural graphics and urban perception. Typical quantitative research methods to measure how cultural graphics affect the perception of a city are structured surveys and questionnaires, as testified by Cassia et al. (2018), who made a comparison of the perception of the residents and tourists of Verona, Italy, by using questionnaires. This study places a focus on the differences in the cultural graphics and representations based on the observer's background and experiences. Qualitative research uses participant observation and interviews to explore how cultural graphic effects on urban experiences are determined in terms of emotions and subjective effects. According to Bowen and Evans (2018), graphic objects were used as contemporary hieroglyphics to deliver shared meanings among different age groups, a necessity in the collective urban experience. A quantitative analysis using the latent class clustering technique explored perceptions of urban sprawl through cultural graphics in Hyderabad, India (Hatab et al., 2021). This method helps researchers understand population variation by showing that urban experiences differ and thus allows them to explore the complicated link between cultural graphics and urban perception.

Structural Equation Modeling (SEM) stands as a favored technique used in urban studies to model complex relationships between hidden variables. The SEM approach lets researchers study cultural graphics effects on urban perception while exploring both

direct and indirect causes and both observable and unobservable variables (Wang et al., 2023). Based on research by Li and Cai (2018) and Libório et al. (2020), Structural Equation Modeling continues to demonstrate its usefulness in urban studies because it analyzes urban satisfaction and public service perception, and spatial inequality. The approach provides valuable insights into complex urban systems because it connects cultural graphics with social identities while examining how they influence perceptions of cities.

2.5. Research Gaps and Rationale for the Study

This research area shows substantial knowledge growth, yet its scope remains incomplete, especially for the case of Qinzhou as a smaller Chinese city. Research on smaller urban environments remains limited because most studies concentrate on larger cities, including Beijing and Shanghai. Urbanization and cultural characteristics have received increasing attention yet few scholars have studied how cultural graphics shape urban perception in quickly developing smaller cities. The research lacks clarity regarding how cultural graphics impact urban identity and perception in Qinzhou, combining distinct local and migrant populations (Chen & Chiu, 2010; Xu & Zheng, 2020). Qinzhou is a prime example for studying how cultural graphics influence urban perception because they possess distinctive cultural attributes and are part of ongoing urban advancement. Understanding cultural graphics' functions in creating urban community identity and belonging becomes essential when Qinzhou works to balance its modern growth with its traditional cultural heritage. The city of Qinzhou presently implements cultural heritage integration into urban designs (Zhu & Huang, 2022) yet researchers have not studied how these plans impact urban perception for residents. This research investigates how cultural graphics based on local cultural and social identities transform urban perception in Qinzhou.

3. Methodology

3.1. Research Design

A non-experimental predictive modeling approach guides this research, which examines how cultural graphics affect urban perception and identity in Qinzhou City. This research investigates the influence of cultural graphics on urban perception as mediated through cultural and social identity using quantitative methods to maintain objective and reliable findings.

The passive review of existing data through non-experimental predictive modeling maintains variable relationships while studying existing datasets. Regression analysis and Structural Equation Modeling (SEM) function as statistical tools to establish empirical relationships between cultural graphics and cultural and social identity with urban perception in this investigation. Research data collection during the second phase investigates how individual values combine with beliefs and media exposure patterns to shape urban perception.

The research design lets scientists study complex relationships through detailed cultural graphic perception analysis while utilizing a big sample size for more robust results.

3.2. Research Location

Qinzhou City within Guangxi Province served as the research setting, including both Qinnan and Qinbei districts. These two districts were selected because they represent different socio-economic environments: Qinnan functions as a business center but Qinbei focuses on industrial activities. The specific district selection ensures researchers obtain detailed knowledge about how cultural graphics shape urban perception across economic zones.

The observations in Qinnan's commercial district demonstrate how cultural graphics affect perceptions within a busy service-based environment. The industrial character of Qinbei centers on workers and industrial development, which presents opposing views on how cultural graphics shaped perceptions during industrial times.

The investigation benefits from this economic diversity because it collects data from various urban settings, which provides comprehensive results for Qinzhou City.

3.3. Research Population

In this study the research participants include residents living in Qinnan and Qinbei districts found within Qinzhou City. The research population consists of diverse individuals who work in commercial and industrial sectors together with people who live in mixed residential areas. The study's diverse sample population represents multiple perspectives about urban identity while analyzing cultural graphics' effects on perceptual understanding.

3.4. Research Sample

The researcher selected participants through random sampling from districts Qinnan and Qinbei found in Qinzhou City. A target of 500 respondents was selected to achieve representative demographic coverage of the population. The study selected its participants from multiple backgrounds while factoring in variables, including age, gender, education level, occupational status, and residential area location. The study design included multiple population segments throughout Qinzhou City with the intention of increasing both research precision and universal application. The research collected 425 valid questionnaires, which established the possibility of reliable analysis.

3.5. Research Instrument

A structured questionnaire functioned as the key data collection instrument, and QuestionStar's online platform distributed the questionnaire. The questionnaire was designed to measure the following constructs:

i. Cultural Identity: An assessment tool determines how strongly people connect to Qinzhou's traditional cultural heritage.
ii. Social Identity: The research evaluates the influence that belonging to social groups has on people's urban environmental perceptions.
iii. Personal Values and Beliefs: The research explores how personal values, along with beliefs, affect an individual's visual recognition of cultural and artistic elements.
iv. Media Consumption: The research analyzes how media platforms influence public understanding of urban identities.

v. Cultural Perception: The study tracks how visual symbols from different cultures modify urban resident' interpretations of their community setting.

The instrument used contained a Likert scale, which provided standardized answers to ensure valid results during data analysis. The platform delivered streamlined data gathering and automated notification systems, which enhanced participant response metrics.

3.6. Data Analysis

Linear Regression and Smart-PLS, in combination with Measurement Model Validation and Structural Model Analysis, were utilized to inspect the relationships between cultural graphics and cultural identity along with social identity and personal values and media consumption and their impact on urban perception.

3.6.1. Linear Regression Analysis

The analysis used linear regression to determine direct linkages between cultural identity, social identity, and urban perception while serving as an initial assessment step. The preliminary analysis revealed fundamental information about the nature of these relationships, which became essential for future model assessment and hypothesis validation work.

3.6.2. Smart-PLS

Smart-PLS Structural Equation Modeling with Partial Least Squares served as the analytical tool because of its ability to process complex relationships in situations involving non-normal data distributions. Bootstrapping enabled the testing of path coefficient significance, which strengthened the overall accuracy of the results.

3.6.3. Measurement Model Validation

A validation test was performed on the measurement model to verify construct reliability and validity before moving forward with analysis. To validate the measurement model, researchers assessed reliability using Cronbach's alpha and composite reliability and checked convergent validity through Average Variance Extracted (AVE). Each construct demonstrated sufficient discriminant validity to prove its uniqueness against the remaining constructs within the model.

3.6.4. Structural Model Analysis

Researchers analyzed the model structure to validate the predicted relationships and measure the predictive power it displayed. The researchers computed path coefficients for direct and indirect effects analysis while using R-squared to determine how much predictor variables explained the variance in the outcome.

3.7 Ethical Approval and Consent to Participate

This research received ethical approval from the University's Research Ethics Committee for its operations. Participants received information about the study goals before researchers obtained their consent to participate. The research participants

received assurances that their responses would remain confidential and that secure systems would keep their data protected. The participants received complete freedom to leave the study whenever they wanted with no adverse effects.

4. Findings

4.1. Reliability

In the study to examine the effects of cultural graphics on urban perception in Qinzhou City, reliability analyses were conducted to confirm the consistency and reliability of the measures. Individuals' perceptions, perceptions of the urban aspects, and perceptions of cultural graphics were all assessed. Cronbach's alpha coefficients were calculated based on the items within the scales using SPSS software to evaluate the internal consistency of the items in the scales. It was accepted that a Cronbach's alpha value greater than 0.70 indicates that the items reliably measured the constructs that the intended constructs related to the relationship between cultural graphics and urban perception.

Cronbach Alpha values for cultural identity, social identity, personal values and beliefs, media consumption, and culture perception are presented in Table 1 Cronbach's Alpha values of constructs ranging from acceptable to excellent reliability are found to be 0.811 to 0.841. Internal consistency coefficients for cultural identity (0.829) and social identity (0.819) constructs are quite high, indicating that the items used to construct them capture the intended concepts well. Also, the reliability of the constructs of personal values and beliefs (0.831) and media consumption (0.811) guarantees that the measures represent respondents' behaviors and preferences.

Table 1: Cronbach Alpha

Value	Cronbach's Alpha	N of Items
Cultural Identity	.829	6
Social Identity	.819	6
Personal Values and Beliefs	.831	12
Media Consumption	.811	12
Culture Perception	.841	10

Culture perception Cronbach's Alpha value of 0.841 among all constructs shows it to be the most reliable construct. This indicates that the ten items measuring culture perception always reflect respondents' views on cultural aspects. Overall, these measures have strong internal consistency, and this is essential to the study because it reinforces the credibility of the result regarding the relationship between cultural graphics and urban perception in Qinzhou City.

4.2. Exploratory Factor Analysis (EFA)

This study used Exploratory Factor Analysis (EFA) to identify the underlying factors that influence the relationship between cultural graphics and urban perception in Qinzhou City. EFA analyzed the correlation characteristics of various variables to identify common traits and patterns and specifically identify how cultural graphics influence user perception of the urban environment. The Kaiser Meyer Olkin (KMO) measure of sampling adequacy was used to determine if the data were appropriate for factor analysis, with values between 0 and 1; a KMO value greater than 0.6 is usually

acceptable to conduct EFA. This analysis was particularly helpful during the early phases of the research because it permitted a search for the number and nature of the factors without presupposing previous hypotheses. In this way, EFA functioned as a foundational method to comprehend the dynamics of cultural graphics and their potential for influencing urban perception.

Table 2 presents the results of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity for Exploratory Factor Analysis (EFA), which was used to explore the cultural graphics and urban perception relationship in Qinzhou City. The correlations between the variables are strong with a KMO value of 0.861, which indicates that factor analysis can be proceeded. A high KMO value indicates a strong link between cultural graphics and a number of aspects of urban perception and enables an inquiry into the joint effect.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.861**
Bartlett's Test of Sphericity	Approx. Chi-Square	8406.527
	df	1035
	Sig.	.000

Bartlett's Test of Sphericity adds further validation to the data with an approximate Chi-Square of 8406.527, 1035 degrees of freedom, and a very significant p-value of 0.000. This result thus confirms that the variables are correlated indicating that it is valid to study the impact of cultural graphics on urban perception. In combination, these findings emphasize the significance of taking cultural graphics into account as drivers of urban identity perception among residents and the understanding of Qinzhou's urban identity.

4.3. Convergent Validity

The convergent validity of the measurement model needs to be tested to establish the relationship between cultural graphics and the urban perception of Qinzhou City. Average Variance Extracted (AVE) is a measure of the validity or the degree to which a construct accounts for the variance of its indicators. A strong convergent validity will be indicated if the AVE is more than 0.5 and the construct explains more than ½ the variance in its indicators. This ensures that the relationship between the constructs of cultural identity and social identity to the perception of culture is expressed accurately. The robust convergent validity solidifies the role of cultural graphics in shaping how inhabitants conceive of the city and the city in turn shaping how inhabitants conceive of the city.

Table 3 shows Average Variance Extracted (AVE) values for constructs in the study and uses cultural graphics and urban perception in Qinzhou City to verify their convergent validity. Furthermore, each construct is found to significantly explain the variance of their corresponding indicators with respective AVEs being greater than the acceptable threshold of 0.5. Notably, the AVE value of Social Identity (0.675) is the highest of all, which indicates that the construct of Social Identity can capture the fine nuances of how social dynamics are seen to affect perceptions of cultural graphics. Similarly, AVE values of 0.642 and 0.641 are high in Cultural Identity and Media Consumption, indicating their significance in promoting users' understanding and interpretation of urban visuals.

Table 3: Convergent Validity

	Average variance extracted (AVE)
Cultural Identity	0.642
Culture Perception	0.575
Media Consumption	0.641
Personal Values and Beliefs	0.613
Social Identity	0.675

Also, the constructs of A Culture Perception and Personal Values and Beliefs have AVE values of 0.575 and 0.613, respectively, further showing how cultural graphics play a role in how users perceive their urban environment. These findings indicate that cultural graphics in Qinzhou reflect the city's heritage and, more importantly, play an important role in forming urban identity, which is an inevitable part of the collective cultural perception of city residents.

4.4. R-Square

Among the algorithms used to assess the correlation between cultural graphics and perception of culture is R-squared, or a coefficient of determination, which determines how well the model describes the data. It measures the percentage of variance in the dependent variable, culture perception, explained by the independent variables, cultural identity, and social identity, as mediated through the variables of personal values and beliefs and media consumption. A high R^2—close to 1—in a good model predicts variations in culture perception, with values around 0.67 suggesting high explanatory power. On the contrary, values near 0.19 denote a low predictive ability of the model, i.e., the importance of cultural graphics in shaping urban perception in Qinzhou City.

The R-squared values in Table 4 show that cultural graphics play a big role in shaping the urban perception of Qinzhou City. Cultural perception is explained by independent variables (cultural identity and social identity) and mediating variables (media consumption and personal values and beliefs), with 85 % of the variance accounted for by an R-squared value of 0.850. The high R square value emphasizes the importance of cultural graphics in defining how residents see their urban environment.

Table 4: R-square

	R-square	R-square adjusted
Culture Perception	0.850	0.849
Media Consumption	0.684	0.683
Personal Values and Beliefs	0.671	0.670

That R-squared value of 0.684 tells us that the R-squared explains 68% of the variance consumed by the predictors in the model. This implies a moderate fit, demonstrating that cultural and social identities shape media consumption patterns and urban perception. The R-squared value for personal values and beliefs is 0.671, consistent with these relationships explaining about 67% of the variance. Taken together, they highlight how cultural graphics, media consumption, personal values, and beliefs are connected in shaping urban identity perceptions in Qinzhou City.

6. Conclusion

Through the cultural graphics examination in Qinzhou City, this study attempts to uncover how cultural identity, social identity, media consumption, and personal values and beliefs affect urban perception. Results indicate that cultural graphics substantially affect how residents perceive the urban environment in Qinzhou. Reliability analysis indicated high reliability for all constructs with Cronbach's Alpha values ranging from 0.811 to 0.841, while the construct of cultural perception reaches 0.841, which is the most consistent. Exploratory Factor Analysis (EFA) confirmed the strong relationship between cultural graphics and urban perception with a KMO of 0.861 and significant Bartlett's Test of Sphericity. All constructs' Average Variance Extracted (AVE) values were more important than 0.5, with social identity (AVE = 0.675) having the strongest correlation with cultural graphics perceptions.

In addition, R-squared analysis showed that cultural graphics, cultural identity, social identity, and mediating factors such as media consumption and personal values explained 85% of the variance in cultural perception, indicating the central role of cultural graphics in defining urban perception. Generally, the study reveals that cultural graphics influence the formation of subjects' cultural and social identity, media consumption habits, and personal values, and cultural graphics are significant factors in determining the city's identity and the way residents perceive the urban space in Qinzhou City.

Ethics Approval and Consent to Participate

This study did not involve human participants. Therefore, no ethical approval or informed consent was necessary.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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