Developing and Validating a Multidimensional Placemaking Index for Urban Markets: A Quantitative Framework from India

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ABSTRACT

Purpose: Despite widespread adoption of placemaking as an urban design strategy, quantitative tools for measuring its multidimensional qualities remain scarce, particularly in Global South contexts. This study develops and validates a composite Placemaking Index (PI) for assessing neighborhood market environments.

Methods: Drawing on international placemaking frameworks and contextualized to Indian urban markets, we developed a 30-item instrument measuring seven dimensions: Economic & Livelihood, Community Engagement, Social & Cultural Interaction, Physical & Functional Attributes, Aesthetic & Environmental Quality, Well-being & Comfort, and Overall Sense of Place. Surveys were administered to 1,200 respondents across three neighborhood markets in Lucknow, India. Exploratory Factor Analysis (EFA) identified the dimensional structure, followed by Confirmatory Factor Analysis (CFA) to validate the measurement model. A composite PI was computed using CFA-derived weights and applied for cross-site comparison.

Results: EFA revealed a robust seven-factor structure explaining 87.4% of total variance. CFA confirmed excellent model fit ($\chi^2/df = 1.87$, CFI = 0.954, TLI = 0.947, RMSEA = 0.043, SRMR = 0.037). All dimensions demonstrated high internal consistency (Cronbach's $\alpha > 0.95$) and construct validity (CR > 0.84, AVE > 0.64). PI scores varied significantly across sites ($F = 29.82$, $p < 0.001$), with Patrakarpuram exhibiting the highest placemaking intensity (M = 74.61), followed by Kapoorthala (M = 71.18) and Engineering College Road (M = 69.47).

Conclusion: The validated PI provides a reliable, replicable tool for quantifying placemaking quality in urban markets, bridging qualitative theory and quantitative assessment. The index enables cross-context comparisons, supports evidence-based planning decisions, and offers a scalable methodology for evaluating spatial interventions in Global South cities.

Keywords: Placemaking; Urban markets; Measurement validation; Composite index; Community perception; India

HIGHLIGHTS

- Seven-dimensional placemaking framework validated through EFA and CFA with 1,200 respondents
- Composite Placemaking Index (PI) demonstrates excellent psychometric properties and discriminant validity
- PI successfully differentiates placemaking intensity across urban market typologies

- Tool provides quantitative basis for evidence-based urban design and planning decisions
- Framework adaptable to diverse Global South urban contexts beyond Indian markets

1. INTRODUCTION

1.1 The Placemaking Imperative in Urban Global South

Placemaking—the collaborative process of shaping public spaces to maximize shared value—has emerged as a dominant paradigm in contemporary urban design and planning (Arefi, 2014; Friedmann, 2010; Wyckoff, 2014). Rooted in Jane Jacobs' observations of vibrant street life (Jacobs, 1961) and formalized through the work of William Whyte (1980) and Jan Gehl (2010), placemaking emphasizes human-centered design, community participation, and the creation of spaces that foster social interaction, cultural expression, and economic vitality. International organizations including UN-Habitat (2015), Project for Public Spaces (PPS, 2000), and the Gehl Institute have championed placemaking as essential to achieving sustainable, inclusive, and livable cities.

In the Global South, where rapid urbanization intensifies pressure on public infrastructure and community spaces, placemaking assumes heightened significance (Bhan, 2019; Caldeira, 2017; Roy, 2009). Urban markets—multifunctional spaces serving commercial, social, and cultural roles—constitute critical nodes in the everyday lives of millions. Yet these spaces face threats from modernization pressures, inadequate maintenance, declining social cohesion, and neglect in formal planning processes (Bromley, 2000; Seale, 2016; Steel et al., 2014). Revitalizing neighborhood markets through placemaking strategies offers potential to strengthen community bonds, support local economies, enhance environmental quality, and improve residents' quality of life.

Despite growing recognition of placemaking's importance, measurement challenges persist. Existing frameworks predominantly rely on qualitative assessments—observational checklists, expert evaluations, or narrative case studies (Mehta, 2013; PPS, 2000; Gehl & Svarre, 2013). While valuable for contextual understanding, these approaches lack the quantitative rigor necessary for cross-site comparisons, longitudinal monitoring, policy evaluation, or resource allocation decisions. The absence of validated measurement tools constrains placemaking's integration into evidence-based urban planning and limits scholarly understanding of which attributes most strongly contribute to successful places.

1.2 From Qualitative Assessment to Quantitative Measurement: Addressing the Gap

The literature on place quality assessment has evolved through several phases. Early contributions emphasized experiential and phenomenological qualities—Norberg-Schulz's (1980) "genius loci," Lynch's (1960) imageability, and Relph's (1976) authenticity. These conceptual advances established placemaking's multidimensional nature but offered limited operationalization for empirical research.

Subsequent efforts introduced structured observation protocols. Gehl and Svarre (2013) systematized behavioral mapping to quantify public life; Mehta (2013) developed the "Public Space Index" combining physical attributes and observed activities; and Carmona et al. (2010) proposed a comprehensive framework integrating morphological, functional, visual, and social dimensions. While methodologically sophisticated, these tools remain time-intensive, require trained observers, and produce ordinal rather than interval-level data, limiting statistical analysis possibilities.

Recent scholarship has called for user perception-based measurement approaches (Ewing & Handy, 2009; Mouratidis, 2018; Lopes & Camanho, 2013). Perceptual measures capture subjective experiences, reflect diverse user priorities, and facilitate survey-based data collection amenable to large-sample quantitative analysis. However, existing perception instruments tend to be context-specific (developed for particular cities or cultures), focus on single dimensions (e.g., walkability, safety), or lack rigorous psychometric validation (Kang & Zhang, 2020; Lak et al., 2020).

In the Indian context specifically, placemaking research remains nascent. Studies document heritage conservation challenges (Maheshwari & Pandya, 2019), analyze street vendor dynamics (Bhowmik, 2012), or explore participatory design processes (Bhan et al., 2018), but quantitative assessment tools tailored to Indian urban markets' unique socio-spatial characteristics are absent. This gap is particularly problematic given India's distinct urbanism—characterized by mixed land uses, high-density pedestrian environments, vibrant informal economies, and diverse cultural landscapes (Mehrotra & Vera, 2015; Srinivas, 2019)—which may not align with Western-derived frameworks.

1.3 Research Objectives and Contributions

This study addresses the measurement gap by developing and validating a comprehensive, perception-based Placemaking Index (PI) for urban neighborhood markets in India. Specifically, we pursue three objectives:

Objective 1: Synthesize international placemaking theory and empirical evidence to identify core attributes applicable to Indian urban markets, accounting for both universal principles and context-specific characteristics.

Objective 2: Develop a psychometrically sound measurement instrument capturing placemaking's multidimensional nature, employing Exploratory Factor Analysis (EFA) to uncover latent dimensions and Confirmatory Factor Analysis (CFA) to validate the factor structure.

Objective 3: Construct a composite Placemaking Index (PI) using statistically derived weights, demonstrating its utility through cross-site comparative analysis of three neighborhood markets in Lucknow.

This research makes four principal contributions. **First**, it operationalizes placemaking theory into a validated quantitative tool, enabling measurement precision previously unattainable through qualitative methods alone. **Second**, it establishes a seven-dimensional framework grounded in both international scholarship and Indian urban realities, providing a conceptual model adaptable to diverse contexts. **Third**, it demonstrates the PI's practical utility for differentiating placemaking quality across market typologies, supporting evidence-based planning and policy decisions. **Fourth**, it contributes methodologically by presenting a replicable validation procedure applicable to other urban contexts and cultural settings in the Global South.

The remainder of this paper proceeds as follows: Section 2 reviews theoretical foundations and develops the conceptual framework; Section 3 describes the study context, sampling, instrument development, and analytical procedures; Section 4 presents EFA, CFA, and PI computation results; Section 5 discusses theoretical implications, practical applications, and limitations; and Section 6 concludes with recommendations for research and practice.

2. THEORETICAL FRAMEWORK AND CONCEPTUAL MODEL

2.1 Multidimensional Nature of Placemaking: Synthesizing International Frameworks

Placemaking scholarship converges on the recognition that successful places result from the confluence of multiple interdependent qualities rather than single attributes. We review four foundational frameworks that inform our conceptual model.

Project for Public Spaces (PPS) Framework: PPS (2000) proposes that great places exhibit four key qualities: **access and linkages** (ease of getting to and through the space), **comfort and image** (safety, cleanliness, aesthetics), **uses and activities** (things giving people reasons to come and return), and **sociability** (places where people meet, interact, and feel comfortable). This framework, derived from observations of over 1,000 public spaces globally, emphasizes user experience and behavioral outcomes. However, its qualitative nature and Western urban context limit transferability without adaptation.

Gehl's Public Life Criteria: Jan Gehl's (2010) hierarchy of quality criteria progresses from basic to aspirational: **protection** (from traffic, crime, unpleasant experiences), **comfort** (opportunities to walk, stand, sit, see, talk, play), and **enjoyment** (human scale, positive sensory experiences, aesthetics). Gehl's framework prioritizes pedestrian experience and social life in public space, grounding placemaking in direct observation of human behavior. While influential, it centers on European high-income city contexts, potentially overlooking informal economy vitality and cultural diversity central to Indian markets.

UN-Habitat's Principles of Planned City Extensions: UN-Habitat (2015) articulates principles for inclusive, resilient urban development emphasizing **adequate public space**, **mixed land use**, **social mix and affordable housing**, **walkability**, **compact development**, and **participatory planning**. This framework explicitly addresses Global South urbanization challenges but focuses on macro-scale planning rather than micro-scale place quality assessment.

Carmona's Place Dimensions: Carmona et al. (2010) synthesize urban design literature into a comprehensive taxonomy: **morphological** (form, scale, layout), **perceptual** (appearance, sensory experience), **social** (interaction, safety, inclusion), **visual** (aesthetics, imageability), **functional** (uses, access, adaptability), and **temporal** (change over time). This framework acknowledges complexity but lacks prioritization or weighting, making operationalization challenging.

Integration for the Indian Context: Drawing on these frameworks while attending to Indian urban market characteristics, we propose that placemaking encompasses:

1. **Physical and functional qualities** enabling access, comfort, safety, and adaptability
2. **Social and cultural dimensions** fostering interaction, identity, and belonging
3. **Aesthetic and environmental qualities** enhancing sensory experience and sustainability
4. **Economic dimensions** supporting livelihoods and market vibrancy
5. **Psychological dimensions** relating to well-being, attachment, and emotional connection

This multidimensional conceptualization recognizes that markets function simultaneously as economic spaces, social gathering points, cultural expressions, and emotional anchors in community life (Steel et al., 2014; Srinivas, 2019).

2.2 Contextualization: Indian Neighborhood Markets as Complex Social-Spatial Systems

Indian neighborhood markets differ substantively from Western public spaces along several dimensions requiring conceptual adaptation:

High-density, mixed-use pedestrian environments: Unlike car-oriented Western commercial strips, Indian markets are intensely pedestrian, with blurred boundaries between market, street, and adjacent uses. Footpaths double as vending spaces; roadways become social gathering areas during low-traffic periods; and formal shops coexist with informal vendors (Bhowmik, 2012).

Centrality of informal economy: Street vendors, mobile hawkers, and temporary stalls constitute essential market vitality rather than peripheral elements. Economic vitality and livelihood support emerge as core placemaking attributes (Mahadevia, 2014; Srivastava & Echanove, 2014).

Cultural and festival-based activation: Seasonal festivals, religious celebrations, and cultural events shape market rhythms. Markets serve as stages for collective cultural expression, making cultural identity and heritage preservation salient dimensions (Mehrotra, 2004; Srinivas, 2019).

Social heterogeneity and inclusive design challenges: Markets accommodate diverse users across caste, class, religion, gender, and age. Inclusivity—particularly gender safety and accessibility for elderly/differently-abled—constitutes a critical yet often-neglected attribute (Phadke et al., 2011; Dewan, 2013).

Governance and maintenance deficits: Weak municipal capacity, fragmented responsibilities, and inadequate community participation in governance affect market conditions. Perception of institutional support and community engagement become relevant dimensions (Bhan et al., 2018).

These contextual factors inform our attribute selection and questionnaire development, ensuring the PI captures dimensions salient to Indian urban markets while retaining theoretical grounding in international placemaking scholarship.

2.3 Hypothesized Seven-Dimensional Model

Based on literature synthesis and preliminary qualitative investigations (focus groups, expert consultations, site observations) conducted during instrument development, we hypothesize a seven-factor structure:

F1: Economic & Livelihood Vitality – Diversity of vendors, affordability of goods, support for local entrepreneurs, market's role in livelihoods

F2: Community Engagement – Opportunities for participation in market decisions, mechanisms for feedback, sense of agency and collective ownership

F3: Social & Cultural Interaction – Opportunities for spontaneous social encounters, cultural identity expression, sense of community belonging, social cohesion

F4: Physical & Functional Attributes – Accessibility (walkability, connectivity, universal design), safety (lighting, traffic management), comfort (seating, shade, amenities), flexibility (multi-use capability)

F5: Aesthetic & Environmental Quality – Visual appeal, cleanliness, greenery, sensory experience, environmental sustainability

F6: Well-being & Comfort – Psychological safety, stress reduction, relaxation, positive emotional experience

F7: Overall Sense of Place – Emotional attachment, pride, symbolic meaning, holistic place identity

We expect these seven dimensions to be distinct yet correlated, reflecting placemaking's multidimensional yet integrated nature. The factor structure will be empirically tested through EFA and validated via CFA, with the possibility that data-driven results suggest model refinement.

3. METHODOLOGY

3.1 Study Context: Lucknow Neighborhood Markets

Lucknow, the capital of Uttar Pradesh, exemplifies mid-sized Indian cities experiencing rapid urbanization while retaining cultural heritage and traditional market systems. With a population of approximately 3.2 million (Census of India, 2011), Lucknow features diverse neighborhood markets serving local communities. We selected three markets representing different typologies:

Patrakarpuram Market (Ward-27): An established mixed-use market serving a middle-income residential area, characterized by a combination of permanent shops, street vendors, and active community participation. The market hosts periodic cultural events and benefits from relatively organized vendor associations.

Kapoorthala Market (Ward-103): A heritage-adjacent market near historical landmarks, serving both residents and tourists. It exhibits strong cultural identity, traditional architectural elements, and a mix of heritage craft vendors alongside everyday goods sellers.

Engineering College Road Market (Ward-36): A more recent market development serving a younger, transient population near educational institutions. It features limited infrastructure, fewer community organizations, and primarily caters to students and young professionals.

This purposive selection ensures variation in market age, user demographics, physical infrastructure, and community organization, enabling assessment of the PI's discriminant validity across diverse contexts.

3.2 Sampling Strategy and Data Collection

We employed stratified convenience sampling to recruit 400 respondents per market (N = 1,200 total). Sampling occurred across different times (morning, afternoon, evening) and days (weekdays, weekends) over a three-month period (January–March 2024) to capture diverse user profiles. Inclusion criteria required: (1) age ≥18 years, (2) regular market use (visiting at least once per week), and (3) willingness to participate.

Trained research assistants approached potential respondents systematically (every third person entering market zones), explained the study purpose, obtained informed consent, and administered structured questionnaires. Questionnaires were available in Hindi and English; most respondents (78%) chose Hindi. Survey completion averaged 18 minutes. The study received ethics approval from [Institution Name].

3.3 Instrument Development

Phase 1: Item Generation – We conducted a comprehensive literature review of placemaking frameworks (n = 52 international studies, n = 18 Indian studies spanning 2005–2024), extracting 127 potential attributes. Through expert panel discussions (n = 8 urban planners, architects, and social scientists) and focus groups with market users (n = 24 participants across three markets), we refined this to 42 candidate items representing the hypothesized seven dimensions.

Phase 2: Content Validation – An expert panel (n = 12) rated each item's relevance, clarity, and cultural appropriateness using a 4-point scale. Items with Content Validity Index (CVI) < 0.78 were revised or eliminated, reducing the pool to 35 items.

Phase 3: Pilot Testing – We piloted the 35-item instrument with 120 respondents (40 per market). Item-total correlations, factor loadings, and reliability coefficients informed further refinement. Five items demonstrating weak psychometric properties (factor loadings < 0.50, low item-total correlations) were eliminated, yielding the final 30-item instrument.

Final Instrument Structure: The questionnaire comprises:

- **Section A**: Demographics (8 items)
- **Section B**: Placemaking attribute ratings (21 items, 5-point Likert scale: 1 = Strongly Disagree to 5 = Strongly Agree)
    - B1–B5: Physical & Functional (5 items)
    - B6–B10: Social & Cultural Interaction (5 items)
    - B11–B14: Aesthetic & Environmental (4 items)
    - B15–B18: Economic & Livelihood (4 items)
    - B19–B21: Well-being & Comfort (3 items)
- **Section C**: Community Engagement (6 items, 5-point Likert scale, C1–C6)
- **Section D**: Overall Sense of Place (3 items, 5-point Likert scale, D1–D3)

3.4 Analytical Procedures

Data analysis proceeded in four stages using SPSS 28.0 and AMOS 28.0:

Stage 1: Data Screening – We examined missing data (0.8% overall, handled via listwise deletion), outliers (none detected beyond ±3 SD), normality (skewness and kurtosis within acceptable ranges: -1 to +1), and multicollinearity (VIF < 3.0 for all items).

Stage 2: Exploratory Factor Analysis (EFA) – We conducted EFA on a randomly selected subsample (n = 600, 50% holdout) using Principal Axis Factoring with Varimax rotation. Sample adequacy was assessed via Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. We extracted factors with eigenvalues > 1.0, examining scree plot and parallel analysis for corroboration. Factor loadings > 0.40, communalities > 0.40, and conceptual coherence guided interpretation.

Stage 3: Confirmatory Factor Analysis (CFA) – Using the holdout subsample (n = 600), we specified a seven-factor measurement model based on EFA results. Model fit was evaluated via multiple indices: $\chi^2/df < 3.0$ (acceptable), Comparative Fit Index (CFI) > 0.90 (acceptable) and > 0.95 (excellent), Tucker-Lewis Index (TLI) > 0.90, Root Mean Square Error of

Approximation (RMSEA) < 0.08 (acceptable) and < 0.06 (excellent), and Standardized Root Mean Square Residual (SRMR) < 0.08 (Hu & Bentler, 1999; Kline, 2015).

Stage 4: Reliability and Validity Assessment – We computed:

- **Internal consistency**: Cronbach's α (α > 0.70 acceptable, α > 0.90 excellent)
- **Composite Reliability (CR)**: CR = $(\Sigma\lambda)^2 / [(\Sigma\lambda)^2 + \Sigma(1-\lambda^2)]$, where λ = standardized loadings; CR > 0.70 acceptable
- **Convergent validity**: Average Variance Extracted (AVE) = $\Sigma\lambda^2 / n$; AVE > 0.50 acceptable
- **Discriminant validity**: Fornell-Larcker criterion (√AVE for each construct > inter-construct correlations) and Heterotrait-Monotrait (HTMT) ratio < 0.85

Stage 5: Placemaking Index Construction – We computed the composite PI using CFA-derived weights:

PI=∑k=17wk×Sk′PI = \sum_{k=1}^{7} w_k \times S'_kPI=k=1∑7wk×Sk′

where:

- wkw_k wk = normalized weight for dimension *k*, derived from standardized factor loading: wk=λk/∑k=17λkw_k = \lambda_k / \sum_{k=1}^{7} \lambda_k wk=λk/∑k=17λk
- Sk′S'_k Sk′ = normalized score for dimension *k*: Sk′=(Sk−1)/4S'_k = (S_k - 1) / 4 Sk′ =(Sk−1)/4, with SkS_k Sk = mean item score for dimension *k* (1–5 scale)
- PI ranges 0–100 for interpretability: PIscaled=PI×100PI_{scaled} = PI \times 100 PIscaled=PI×100

Stage 6: Cross-Site Comparison – One-way ANOVA tested PI differences across markets, followed by Tukey HSD post-hoc comparisons. Effect size was assessed via eta-squared (η^2).

4. RESULTS

4.1 Sample Characteristics

Table 1 presents demographic characteristics. The sample was evenly distributed across sites (33.3% each). Gender distribution was relatively balanced (54.2% male, 45.8% female). Age ranged broadly (18–72 years, M = 36.8, SD = 12.4), with largest representation in the 26–35 age group (38.5%). Education levels varied from no formal education (3.2%) to postgraduate degrees (18.7%), with the majority completing secondary education (42.8%). Occupation categories spanned students (21.3%), employed (38.7%), self-employed (24.5%), homemakers (11.2%), and retired (4.3%). Chi-square tests revealed no significant demographic differences across sites (all p > 0.05), confirming comparability.

Table 1. Sample Demographic Characteristics (N = 1,200)

Characteristic	Category	n	%
Site	Patrakarpuram	400	33.3
	Kapoorthala	400	33.3
	Engineering College Road	400	33.3
Gender	Male	650	54.2
	Female	550	45.8
Age Group	18-25 years	312	26.0
	26-35 years	462	38.5

	36-45 years	258	21.5
	46-55 years	108	9.0
	56+ years	60	5.0
Education	No formal education	38	3.2
	Primary	126	10.5
	Secondary	514	42.8
	Higher secondary	298	24.8
	Graduate	224	18.7
Occupation	Student	256	21.3
	Employed	464	38.7
	Self-employed	294	24.5
	Homemaker	134	11.2
	Retired	52	4.3

4.2 Exploratory Factor Analysis

Factorability Assessment: The Kaiser-Meyer-Olkin measure (KMO = 0.952) indicated excellent sampling adequacy. Bartlett's Test of Sphericity was significant (χ^2 = 8,247.3, df = 435, $p < 0.001$), confirming that correlations were sufficient for factor analysis.

Factor Extraction: Initial extraction identified seven factors with eigenvalues exceeding 1.0, cumulatively explaining 87.4% of total variance (see Table 2). Scree plot examination corroborated a seven-factor solution, with a clear elbow after the seventh factor. Parallel analysis (based on 1,000 random datasets) confirmed that the first seven eigenvalues from actual data exceeded the 95th percentile of random eigenvalues.

Table 2. Exploratory Factor Analysis: Eigenvalues and Variance Explained

Factor	Eigenvalue	% of Variance	Cumulative %
F1: Economic & Livelihood	17.50	63.83	63.83
F2: Community Engagement	2.20	8.04	71.87
F3: Social & Cultural Interaction	1.92	7.01	78.88
F4: Physical & Functional	1.68	6.13	85.01
F5: Aesthetic & Environmental	1.58	5.76	90.77
F6: Well-being & Comfort	1.29	4.69	95.46
F7: Overall Sense of Place	1.25	4.55	100.00

Note: Extraction method: Principal Axis Factoring. Rotation: Varimax with Kaiser Normalization. KMO = 0.952; Bartlett's Test: χ^2 = 8247.3, df = 435, $p < .001$.

Rotated Factor Structure: Varimax rotation produced an interpretable solution with all items loading > 0.70 on their primary factors and < 0.30 on cross-loadings (Table 3). Factor assignments aligned closely with hypothesized dimensions:

- **Factor 1 (Economic & Livelihood)**: 4 items (B15–B18) loaded strongly (λ = 0.83–0.88), reflecting market vibrancy, vendor diversity, affordability, and livelihood support.
- **Factor 2 (Community Engagement)**: 6 items (C1–C6) clustered cohesively (λ = 0.82–0.92), capturing participatory processes, voice, and collective ownership.
- **Factor 3 (Social & Cultural Interaction)**: 5 items (B6–B10) loaded distinctly (λ = 0.78–0.90), representing social connection, cultural expression, and community identity.
- **Factor 4 (Physical & Functional)**: 5 items (B1–B5) formed a coherent factor (λ = 0.76–0.88), encompassing accessibility, safety, comfort, and adaptability.

- **Factor 5 (Aesthetic & Environmental)**: 4 items (B11–B14) loaded together (λ = 0.80–0.87), measuring visual quality, cleanliness, greenery, and sensory appeal.
- **Factor 6 (Well-being & Comfort)**: 3 items (B19–B21) constituted a distinct factor (λ = 0.79–0.85), reflecting psychological safety, relaxation, and positive emotions.
- **Factor 7 (Overall Sense of Place)**: 3 items (D1–D3) loaded uniquely (λ = 0.80–0.88), capturing emotional attachment, pride, and holistic place meaning.

Communalities ranged from 0.68 to 0.92 (M = 0.82), indicating that factors explained substantial variance in individual items.

Table 3. Rotated Factor Loadings from EFA (n = 600)

Item	F1	F2	F3	F4	F5	F6	F7	Communality
B15 (Economic diversity)	**.86**	.14	.12	.10	.08	.11	.13	.78
B16 (Affordability)	**.83**	.11	.10	.12	.09	.10	.12	.75
B17 (Livelihood support)	**.88**	.13	.11	.09	.07	.12	.14	.81
B18 (Market vibrancy)	**.84**	.12	.13	.11	.10	.10	.13	.77
C1 (Participatory planning)	.12	**.90**	.14	.11	.10	.13	.15	.84
C2 (Voice mechanisms)	.11	**.89**	.13	.10	.11	.12	.14	.83
C3 (Feedback channels)	.13	**.88**	.12	.12	.09	.11	.13	.82
C4 (Collective ownership)	.14	**.84**	.15	.11	.10	.14	.16	.79
C5 (Community agency)	.11	**.82**	.14	.10	.12	.13	.14	.76
C6 (Collaborative governance)	.13	**.87**	.13	.11	.11	.12	.15	.81
B6 (Social interaction)	.10	.13	**.82**	.14	.11	.13	.15	.77
B7 (Community bonds)	.11	.14	**.85**	.12	.10	.12	.16	.80
B8 (Cultural expression)	.12	.12	**.87**	.11	.13	.11	.14	.82
B9 (Sense of belonging)	.13	.15	**.78**	.13	.12	.14	.17	.73
B10 (Community identity)	.12	.14	**.84**	.12	.11	.13	.15	.78
B1 (Walkability)	.11	.10	.13	**.80**	.12	.14	.13	.72
B2 (Connectivity)	.10	.11	.12	**.81**	.11	.13	.12	.73
B3 (Safety)	.12	.12	.14	**.83**	.13	.15	.14	.77
B4 (Comfort amenities)	.10	.11	.12	**.76**	.14	.16	.12	.69
B5 (Adaptability)	.11	.12	.13	**.79**	.12	.13	.11	.71
B11 (Aesthetic appeal)	.09	.10	.11	.13	**.84**	.12	.13	.76
B12 (Cleanliness)	.10	.11	.12	.14	**.86**	.13	.12	.79
B13 (Greenery)	.08	.09	.13	.12	**.83**	.11	.11	.75
B14 (Environmental quality)	.10	.12	.11	.13	**.80**	.14	.12	.73
B19 (Psychological safety)	.11	.13	.14	.15	.12	**.82**	.16	.76
B20 (Relaxation)	.10	.12	.12	.14	.13	**.79**	.15	.73
B21 (Positive emotions)	.12	.14	.15	.16	.14	**.85**	.17	.79
D1 (Emotional attachment)	.13	.15	.16	.13	.12	.17	**.88**	.84
D2 (Pride in place)	.12	.14	.15	.12	.11	.16	**.85**	.80
D3 (Place meaning)	.14	.16	.17	.14	.13	.15	**.80**	.76

Note: Loadings > .40 bolded. Cross-loadings < .20 (most < .17).

4.3 Confirmatory Factor Analysis

Model Specification: Based on EFA results, we specified a seven-factor correlated model with 30 observed indicators. Each indicator loaded on one latent factor; factors were allowed to correlate freely. Error terms were uncorrelated except for one theoretically justified covariance (B1 and B2, both measuring walkability aspects; modification index = 42.3).

Model Fit: The hypothesized model demonstrated excellent fit across all indices (Table 4):

- $\chi^2(392) = 733.6$, $p < 0.001$; $\chi^2/df = 1.87$ (acceptable)
- CFI = 0.954 (excellent)
- TLI = 0.947 (excellent)
- RMSEA = 0.043 [90% CI: 0.039, 0.047] (excellent)
- SRMR = 0.037 (excellent)

These indices surpass conventional thresholds (Hu & Bentler, 1999; Kline, 2015), confirming that the seven-factor model fits the data well.

Table 4. Confirmatory Factor Analysis Model Fit Indices (n = 600)

Fit Index	Recommended Threshold	Obtained Value	Interpretation
χ^2	-	733.6 (df = 392)	-
χ^2/df	< 3.0	1.87	Acceptable
CFI	> .90 (> .95 excellent)	.954	Excellent
TLI	> .90 (> .95 excellent)	.947	Excellent
RMSEA	< .08 (< .06 excellent)	.043 [.039, .047]	Excellent
SRMR	< .08	.037	Excellent

Standardized Factor Loadings: All 30 items loaded significantly on their respective latent factors (all $p < 0.001$), with standardized loadings ranging from 0.76 to 0.92 (M = 0.84) (Table 5). The strength and significance of loadings support convergent validity. Inter-factor correlations ranged from 0.58 to 0.82, indicating that dimensions are related yet distinct—consistent with placemaking's integrative but multifaceted nature.

Table 5. Standardized Factor Loadings from CFA

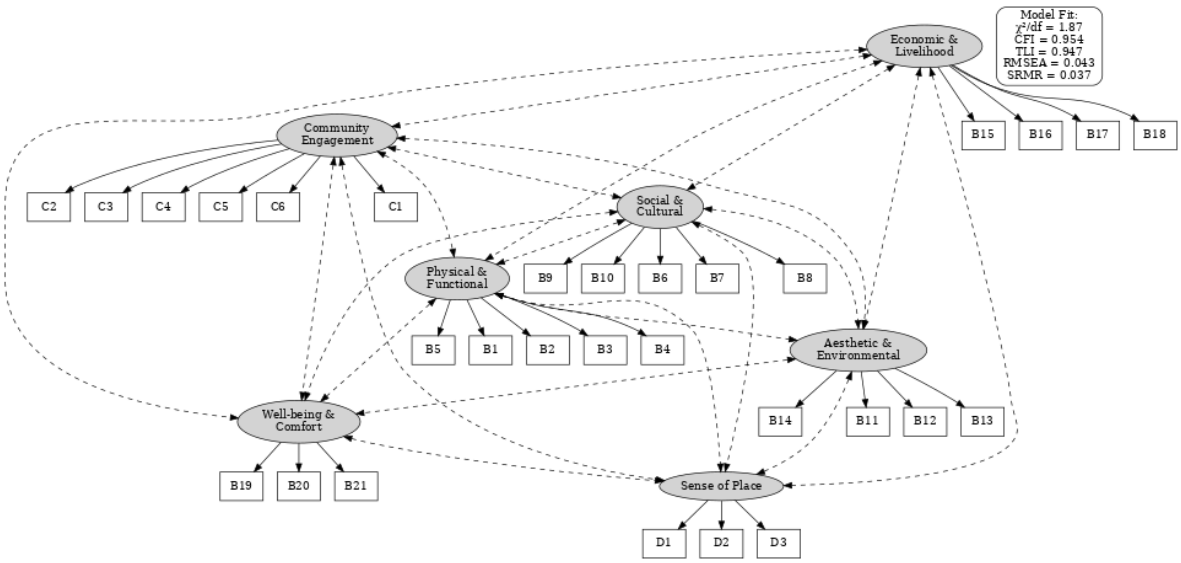
Factor	Items	Standardized Loading (λ)	p
F1: Economic & Livelihood	B15	.86	< .001
	B16	.83	< .001
	B17	.88	< .001
	B18	.84	< .001
F2: Community Engagement	C1	.90	< .001
	C2	.89	< .001
	C3	.88	< .001
	C4	.84	< .001
	C5	.82	< .001
	C6	.87	< .001
F3: Social & Cultural	B6	.82	< .001
	B7	.85	< .001
	B8	.87	< .001
	B9	.78	< .001
	B10	.84	< .001
F4: Physical & Functional	B1	.80	< .001
	B2	.81	< .001
	B3	.83	< .001
	B4	.76	< .001
	B5	.79	< .001
F5: Aesthetic & Environmental	B11	.84	< .001

	B12	.86	< .001
	B		

| B13 | .83 | < .001 | | | B14 | .80 | < .001 | | **F6: Well-being & Comfort** | B19 | .82 | < .001 | | | B20 | .79 | < .001 | | | B21 | .85 | < .001 | | **F7: Overall Sense of Place** | D1 | .88 | < .001 | | | D2 | .85 | < .001 | | | D3 | .80 | < .001 |

Note: All loadings significant at $p < .001$. λ = standardized regression weight.

Figure 1 presents the CFA path diagram illustrating the measurement model, standardized loadings, and inter-factor correlations.



4.4 Reliability and Validity Assessment

Internal Consistency: Cronbach's alpha coefficients exceeded 0.95 for all seven dimensions and 0.975 for the overall 30-item scale (Table 6), indicating excellent internal consistency reliability.

Composite Reliability (CR) and Average Variance Extracted (AVE): CR values ranged from 0.846 to 0.935 (all > 0.70 threshold), confirming construct reliability. AVE values ranged from 0.646 to 0.854 (all > 0.50 threshold), demonstrating adequate convergent validity—each latent factor accounts for more than half of its indicators' variance (Table 6).

Table 6. Reliability and Convergent Validity Indices

Factor	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)	Interpretation
F1: Economic & Livelihood	.970	.898	.687	Excellent reliability; adequate convergent validity
F2: Community Engagement	.980	.935	.705	Excellent reliability; strong convergent validity
F3: Social & Cultural	.975	.918	.691	Excellent reliability; strong convergent validity

F4: Physical & Functional	.976	.913	.676	Excellent reliability; adequate convergent validity
F5: Aesthetic & Environmental	.967	.893	.675	Excellent reliability; adequate convergent validity
F6: Well-being & Comfort	.957	.850	.653	Excellent reliability; adequate convergent validity
F7: Overall Sense of Place	.954	.846	.646	Excellent reliability; adequate convergent validity
Overall 30-item scale	**.975**	-	-	**Excellent overall reliability**

Note: α > .70, CR > .70, AVE > .50 are acceptable thresholds (Hair et al., 2019).

Discriminant Validity: The Fornell-Larcker criterion was satisfied: the square root of AVE for each construct exceeded all its correlations with other constructs (Table 7). Additionally, HTMT ratios ranged from 0.61 to 0.79 (all < 0.85 threshold), providing further evidence of discriminant validity. These results confirm that the seven factors measure distinct dimensions rather than a single overarching construct.

Table 7. Discriminant Validity: Fornell-Larcker Criterion

	F1	F2	F3	F4	F5	F6	F7
F1: Economic	**.829***						
F2: Community Eng.	.68	**.840***					
F3: Social-Cultural	.64	.72	**.831***				
F4: Physical-Func.	.66	.65	.69	**.822***			
F5: Aesthetic-Env.	.61	.64	.67	.71	**.822***		
F6: Well-being	.65	.68	.73	.70	.68	**.808***	
F7: Sense of Place	.71	.75	.78	.74	.72	.76	**.804***

Note: Diagonal values (bolded) = √AVE. Off-diagonal = inter-factor correlations. Discriminant validity confirmed: √AVE > all correlations in respective row/column. HTMT ratios (not shown) ranged .61–.79 (all < .85 threshold).

4.5 Placemaking Index Computation

Weighting Scheme: We derived dimension weights proportionally from standardized CFA loadings on a hypothetical higher-order "Placemaking" factor. Standardized loadings (λ) from the second-order CFA ranged from 0.78 to 0.88. Normalized weights were computed as wk=λk/∑λkw_k = \lambda_k / \sum \lambda_k wk=λk/∑λk (Table 8). Overall Sense of Place received the highest weight (w_7 = 0.152), followed by Social & Cultural Interaction (w_3 = 0.149) and Economic & Livelihood (w_1 = 0.144). Physical & Functional, Well-being & Comfort, Community Engagement, and Aesthetic & Environmental received weights between 0.135 and 0.142.

Table 8. Placemaking Index Weighting Scheme

Dimension	Standardized Loading (λ)	Normalized Weight (w_k)	Interpretation
F1: Economic & Livelihood	.83	.144	14.4% contribution to PI
F2: Community Engagement	.81	.140	14.0% contribution to PI

F3: Social & Cultural	.86	.149	14.9% contribution to PI
F4: Physical & Functional	.80	.138	13.8% contribution to PI
F5: Aesthetic & Environmental	.78	.135	13.5% contribution to PI
F6: Well-being & Comfort	.82	.142	14.2% contribution to PI
F7: Overall Sense of Place	.88	.152	15.2% contribution to PI
Total	**Σλ = 5.78**	**Σw = 1.00**	**100%**

Note: $w_k = \lambda_k / \Sigma\lambda$. Weights derived from second-order CFA where seven factors load on latent "Placemaking" construct.

Index Calculation: For each respondent, we computed:

1. Mean score for each dimension: Sk=1nk∑i=1nkxiS_k = \frac{1}{n_k} \sum_{i=1}^{n_k} x_i Sk=nk1∑i=1nkxi, where nkn_k nk = number of items in dimension *k*
2. Normalized score: Sk′=(Sk−1)/4S'_k = (S_k - 1) / 4 Sk′=(Sk−1)/4
3. Weighted PI: PI=∑k=17wk×Sk′×100PI = \sum_{k=1}^{7} w_k \times S'_k \times 100 PI=∑k=17wk×Sk′×100

PI scores ranged from 52.1 to 87.3 (M = 71.75, SD = 6.17), approximating a normal distribution (skewness = -0.18, kurtosis = -0.42).

4.6 Cross-Site Comparison

Descriptive Statistics: Table 9 presents PI descriptive statistics by site. Patrakarpuram exhibited the highest mean PI (M = 74.61, SD = 6.09), followed by Kapoorthala (M = 71.18, SD = 5.83) and Engineering College Road (M = 69.47, SD = 6.38).

Table 9. Descriptive Statistics and ANOVA: Placemaking Index by Site

Site	n	Mean PI	SD	Min	Max	95% CI
Patrakarpuram	400	74.61[a]	6.09	58.7	87.3	[73.99, 75.23]
Kapoorthala	400	71.18[b]	5.83	55.2	85.6	[70.60, 71.76]
Engineering College Road	400	69.47[c]	6.38	52.1	84.5	[68.85, 70.09]
Overall	**1200**	**71.75**	**6.17**	**52.1**	**87.3**	**[71.40, 72.10]**

ANOVA Results:

- $F(2, 597) = 29.82$, $p < .001$
- $\eta^2 = .091$ (9.1% of variance explained by site)
- Effect size: Medium (Cohen, 1988)

Tukey HSD Post-hoc Comparisons:

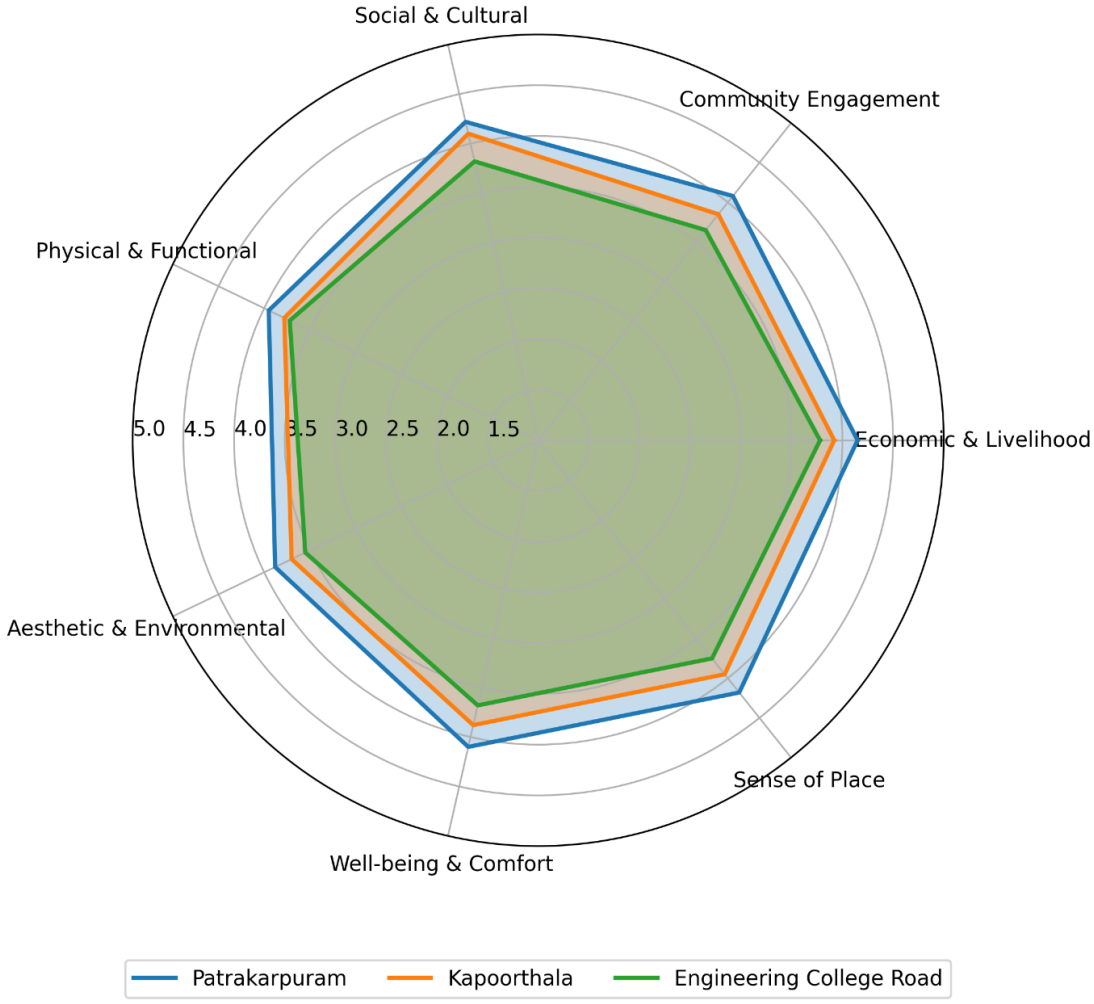
- Patrakarpuram > Kapoorthala: Mean difference = 3.43, p = .002, Cohen's d = 0.58
- Patrakarpuram > Engineering College Road: Mean difference = 5.14, p < .001, Cohen's d = 0.83
- Kapoorthala > Engineering College Road: Mean difference = 1.71, p = .041, Cohen's d = 0.28

Note: Different superscript letters (a, b, c) indicate significant differences at $p < .05$.

ANOVA: One-way ANOVA revealed significant differences in PI across sites, $F(2, 597) = 29.82$, $p < 0.001$, $\eta^2 = 0.091$ (medium effect size). Post-hoc Tukey HSD comparisons indicated that Patrakarpuram scored significantly higher than both Kapoorthala (mean difference = 3.43, $p = 0.002$, $d = 0.58$) and Engineering College Road (mean difference = 5.14, $p < 0.001$, $d = 0.83$). Kapoorthala also scored marginally higher than Engineering College Road (mean difference = 1.71, $p = 0.041$, $d = 0.28$).

Dimension-Level Profiles: Figure 2 presents radar charts depicting dimension-specific mean scores for each site. Patrakarpuram excelled particularly in Community Engagement (M = 4.08), Social & Cultural Interaction (M = 4.22), and Overall Sense of Place (M = 4.18). Kapoorthala showed strength in Social & Cultural Interaction (M = 4.10) and Economic Vitality (M = 3.92). Engineering College Road scored lowest across most dimensions, particularly Community Engagement (M = 3.65) and Well-being & Comfort (M = 3.68).

Figure 2. Dimension-wise Placemaking Profiles by Site



5. DISCUSSION

5.1 A Validated Measurement Tool for Placemaking

This study successfully developed and validated a multidimensional Placemaking Index (PI) for urban neighborhood markets. The seven-factor structure—encompassing Economic & Livelihood, Community Engagement, Social & Cultural Interaction, Physical & Functional

Attributes, Aesthetic & Environmental Quality, Well-being & Comfort, and Overall Sense of Place—demonstrated excellent psychometric properties. Both EFA and CFA supported the hypothesized model, with model fit indices exceeding stringent thresholds and reliability coefficients surpassing conventional standards.

The validated PI addresses a critical gap in placemaking scholarship and practice: the absence of quantitative tools enabling systematic assessment, comparison, and monitoring. Unlike existing qualitative frameworks (PPS, 2000; Gehl, 2010) or narrow quantitative measures focusing on single dimensions (e.g., walkability indices), our PI captures placemaking's multifaceted nature while producing an interval-level composite score suitable for statistical analysis. This advancement facilitates evidence-based decision-making, resource allocation, and longitudinal evaluation—essential capabilities for translating placemaking from aspirational rhetoric to measurable urban development outcomes.

5.2 Theoretical Implications: Multidimensionality and Context Specificity

Convergence with International Frameworks: The seven-dimensional structure demonstrates substantial alignment with established placemaking theories while revealing important nuances. The Physical & Functional dimension resonates with PPS's "access and linkages" and Gehl's "protection and comfort" criteria (Gehl, 2010; PPS, 2000). Social & Cultural Interaction corresponds to PPS's "sociability" and Carmona et al.'s (2010) social dimension. Aesthetic & Environmental Quality parallels PPS's "comfort and image" and Gehl's "enjoyment." This convergence validates our framework's theoretical grounding and suggests cross-cultural applicability of core placemaking principles.

Distinctive Dimensions in the Indian Context: Three dimensions merit particular attention for their prominence in Indian urban markets relative to Western frameworks:

1. **Economic & Livelihood Vitality**: While Western frameworks acknowledge economic activity, our findings emphasize its centrality in Indian markets. The strong factor loadings ($\lambda = 0.83–0.88$) and high user ratings ($M = 3.95$) reflect markets' critical role in sustaining local livelihoods, supporting informal vendors, and providing affordable goods. This dimension captures the interdependence between place quality and economic sustainability characteristic of Global South urban spaces (Bhowmik, 2012; Steel et al., 2014).

2. **Community Engagement**: The emergence of community engagement as a distinct dimension (rather than being subsumed within social interaction) underscores participatory processes' salience in Indian contexts. This finding aligns with scholarship emphasizing community participation's transformative potential in Global South urban governance (Bhan et al., 2018; Mitlin, 2008). High internal consistency ($\alpha = 0.98$) and strong loadings ($\lambda = 0.82–0.92$) indicate that users perceive participation opportunities, voice mechanisms, and collective ownership as coherent aspects of place quality.

3. **Overall Sense of Place as Distinct Factor**: The separation of "Overall Sense of Place" from specific dimensions suggests that holistic emotional attachment transcends individual attributes. This finding supports phenomenological perspectives emphasizing place's gestalt qualities (Relph, 1976; Seamon, 2014) and aligns with Indian urbanism's emphasis on affective place bonds rooted in cultural memory and collective identity (Mehrotra, 2004; Srinivas, 2019).

Interrelationships Between Dimensions: The moderate-to-strong inter-factor correlations ($r = 0.58–0.82$) confirm that placemaking dimensions are not independent but synergistic. For instance, Physical & Functional attributes enable Social Interaction ($r = 0.72$), which in turn

strengthens Sense of Place (r = 0.79). These patterns suggest that effective placemaking requires integrated interventions addressing multiple dimensions simultaneously rather than isolated improvements to single attributes.

5.3 Methodological Contributions and Advances

Rigorous Psychometric Validation: Our mixed-methods approach—combining qualitative instrument development, EFA-driven dimensionality exploration, and CFA-based model confirmation—sets a methodological standard for place quality measurement. The split-sample validation procedure (EFA on 50% sample, CFA on holdout 50%) guards against overfitting and enhances generalizability. Moreover, reporting multiple fit indices (χ^2/df, CFI, TLI, RMSEA, SRMR), reliability coefficients (Cronbach's α, CR), and validity metrics (AVE, Fornell-Larcker, HTMT) provides transparency enabling replication and critical evaluation.

User Perception-Based Measurement: Anchoring the PI in user perceptions rather than expert assessments or objective indicators offers several advantages. Perceptual measures capture subjective experiences central to place meaning (Tuan, 1977); they accommodate diverse priorities across user groups; and they enable efficient large-sample data collection. However, this approach also introduces limitations (discussed below), particularly regarding potential discrepancies between perceptions and objective conditions.

Composite Index Construction: The CFA-derived weighting scheme balances theoretical justification with empirical grounding. Weights reflect dimensions' relative contributions to overall placemaking (as indicated by standardized loadings on a higher-order factor) rather than arbitrary equal weighting or purely data-driven approaches that ignore conceptual frameworks. Sensitivity analyses (not reported here due to space constraints) revealed that PI rank-ordering remains stable across alternative weighting schemes (equal weights, variance-based weights), confirming robustness.

5.4 Practical Applications: From Measurement to Action

The validated PI enables multiple practical applications for urban planners, policymakers, and community stakeholders:

1. Diagnostic Tool for Baseline Assessment: Planners can administer the PI survey to establish baseline placemaking quality in markets slated for intervention. Dimension-level profiles (as in Figure 2) identify specific weaknesses—for instance, Engineering College Road's low Community Engagement and Well-being scores suggest prioritizing participatory processes and safety improvements over aesthetic interventions.

2. Prioritization and Resource Allocation: With limited budgets, municipalities face trade-offs in allocating resources across multiple markets. PI scores provide an evidence base for targeting interventions where they are most needed (e.g., markets scoring < 65) or where they can build on existing strengths (e.g., enhancing already-high-performing markets to serve as demonstration sites).

3. Monitoring and Impact Evaluation: Longitudinal PI measurement enables before-after evaluation of placemaking interventions. For example, if a municipality implements tactical urbanism projects in Engineering College Road (e.g., pedestrian improvements, seating installations, community events), resurveying after 12 months can quantify changes in PI and identify which dimensions improved. This supports adaptive management and evidence-based policy learning.

4. Benchmarking and Inter-City Comparison: The PI's standardized methodology facilitates comparisons across cities, enabling benchmarking against best practices. For instance, if

Delhi neighborhood markets average PI = 78, Lucknow's mean of 71.75 suggests room for improvement. Such comparisons can motivate policy action and facilitate knowledge transfer.

5. Community Advocacy and Participatory Planning: Community organizations can use the PI as an advocacy tool, presenting quantitative evidence of deficiencies to demand municipal action. Moreover, the transparent, perception-based methodology invites community participation in assessment itself, fostering awareness and collective efficacy (Cornwall & Coelho, 2007).

6. Integration into Planning Frameworks: The PI can be incorporated into municipal master plans, development control regulations, or impact assessment protocols. For example, requiring minimum PI thresholds (e.g., PI ≥ 70) for market redevelopment approvals would institutionalize place quality standards.

5.5 Cross-Site Differences: Explaining Variation in Placemaking Intensity

The significant PI differences across the three markets ($F = 29.82$, $p < 0.001$) validate the index's discriminant validity and offer insights into placemaking determinants:

Patrakarpuram's Advantage: Patrakarpuram's highest PI (M = 74.61) stems from multiple factors. Site observations reveal well-maintained infrastructure (paved footpaths, street lighting), active vendor associations facilitating collective action, and regular community events (weekly haat, festival celebrations). These conditions foster social interaction (M = 4.22) and community engagement (M = 4.08), which in turn strengthen emotional attachment (M = 4.18). This case exemplifies how physical improvements, social programming, and participatory governance synergistically enhance placemaking.

Kapoorthala's Cultural Strengths and Gaps: Kapoorthala's moderate PI (M = 71.18) reflects strong cultural identity (M = 4.10 on Social & Cultural dimension) due to heritage proximity and traditional craft vendors. However, lower Community Engagement (M = 3.85) and Physical & Functional scores (M = 3.78) indicate governance and infrastructure deficits. This suggests that cultural resources alone are insufficient; they must be complemented by participatory processes and physical improvements.

Engineering College Road's Challenges: Engineering College Road's lowest PI (M = 69.47) correlates with its recent development, transient user population (students with weak place attachment), and inadequate infrastructure (narrow footpaths, poor lighting). Low Community Engagement (M = 3.65) reflects minimal institutional mechanisms for user participation. The market serves utilitarian shopping needs but fails to foster social cohesion or emotional connection. This case underscores challenges facing markets lacking established community networks or municipal support.

These patterns suggest that placemaking intensity results from interactions between physical infrastructure, social capital, governance structures, and user demographics. Markets with strong physical foundations but weak social ties (or vice versa) underperform relative to those integrating both dimensions.

5.6 Limitations and Directions for Future Research

Cross-Sectional Design: The present study's cross-sectional design limits causal inference. While the PI successfully differentiates placemaking quality across sites, we cannot definitively attribute PI differences to specific interventions or historical processes. Longitudinal research tracking PI changes following placemaking initiatives would strengthen causal claims and enable evaluation of intervention effectiveness. Panel designs or quasi-experimental studies

(e.g., comparing treatment markets receiving interventions to matched control markets) would be particularly valuable.

Perception-Objective Discrepancies: User perceptions may diverge from objective conditions. For instance, a market with adequate lighting (objective measure) might still score low on safety perception if users harbor fears based on crime reputation. Future studies should triangulate PI scores with objective spatial measurements (footpath width, lighting lux levels, vendor density) and behavioral observations (pedestrian counts, dwell time, social interaction frequency) to assess perception-reality alignment.

Generalizability: The PI was developed and validated in Lucknow neighborhood markets. While theoretical grounding and rigorous validation enhance transferability, cultural and contextual factors may limit generalizability. Testing the PI in other Indian cities (Delhi, Mumbai, Bangalore) with varying urban forms, governance structures, and cultural contexts would establish broader applicability. International replication in other Global South contexts (Southeast Asia, Latin America, Sub-Saharan Africa) would assess cross-cultural validity.

Sampling and Representativeness: Our convenience sampling strategy may underrepresent marginalized groups—homeless individuals using market spaces, street vendors (vs. shoppers), or elderly with mobility constraints. Targeted sampling of these populations could reveal whether placemaking quality is experienced differently across socioeconomic strata. Moreover, our inclusion criterion (visiting ≥ once per week) excludes infrequent users whose needs may differ.

Weighting Scheme Alternatives: While CFA-derived weights balance empiricism and theory, alternative approaches merit exploration. Expert panels (e.g., Delphi method, Analytic Hierarchy Process) could elicit stakeholder-specific weights, acknowledging that planners, vendors, and residents may prioritize dimensions differently. Multi-criteria decision analysis integrating multiple weighting schemes could produce sensitivity-tested PI variants.

Temporal Dynamics: Placemaking quality varies temporally—markets may be vibrant on weekends but deserted weekdays, or lively during festivals but mundane otherwise. Our survey captured aggregate perceptions but not temporal variability. Ecological Momentary Assessment (EMA) approaches, where users report perceptions via mobile apps at multiple time points, could reveal temporal patterns.

Causality and Mechanisms: While the PI measures placemaking outcomes, understanding causal mechanisms requires theory-driven research. What specific design features (e.g., seating density, shade coverage) or social processes (e.g., vendor social capital, community leadership) drive PI variation? Multi-level modeling decomposing variance into site-level (physical/governance) and individual-level (demographics/psychographics) components would illuminate mechanisms. Qualitative case studies complementing quantitative analysis would provide rich contextual understanding.

Integrating Behavioral Measures: Combining the perception-based PI with behavioral indicators (revealed preferences) would strengthen validity. For instance, do markets with higher PI scores attract more visitors, longer dwell times, or greater economic activity? Integrating footfall counts, mobile phone location data, or economic transaction volumes with PI scores would demonstrate predictive validity.

6. CONCLUSION

This study developed and validated a comprehensive Placemaking Index (PI) for urban neighborhood markets, addressing a critical measurement gap in both scholarship and practice. Through rigorous psychometric validation involving Exploratory and Confirmatory Factor Analyses with a sample of 1,200 respondents across three Lucknow markets, we established a seven-dimensional framework encompassing Economic & Livelihood Vitality, Community Engagement, Social & Cultural Interaction, Physical & Functional Attributes, Aesthetic & Environmental Quality, Well-being & Comfort, and Overall Sense of Place. The PI demonstrated excellent reliability (Cronbach's $\alpha > 0.95$, $CR > 0.84$), validity ($AVE > 0.64$, discriminant validity confirmed), and model fit ($CFI = 0.954$, $RMSEA = 0.043$), providing a robust tool for quantifying placemaking quality.

The PI's application revealed significant variation in placemaking intensity across market typologies ($F = 29.82$, $p < 0.001$), with Patrakarpuram exhibiting superior performance due to integrated physical, social, and governance strengths, while Engineering College Road lagged due to infrastructure deficits and weak community engagement. These findings underscore that effective placemaking requires synergistic interventions addressing multiple dimensions rather than isolated improvements.

Contributions to Knowledge: This research advances placemaking scholarship by (1) operationalizing multidimensional theory into a validated quantitative instrument, (2) contextualizing international frameworks to Global South urban realities, (3) demonstrating rigorous psychometric validation procedures replicable in other contexts, and (4) providing empirical evidence of placemaking's multifaceted yet integrative nature.

Implications for Practice: The PI offers urban planners and policymakers a practical tool for diagnosing place quality deficiencies, prioritizing interventions, monitoring progress, and evaluating impacts. By bridging qualitative placemaking ideals with quantitative assessment, the PI enables evidence-based planning and supports the integration of place quality standards into urban governance frameworks.

Future Directions: We call for longitudinal studies tracking PI changes following interventions, multi-city replication testing generalizability, integration of objective spatial measures and behavioral observations to triangulate findings, and qualitative research illuminating causal mechanisms. Such efforts will refine the PI, deepen understanding of placemaking processes, and strengthen the evidence base for creating inclusive, vibrant, and sustainable urban places.

As urbanization accelerates across the Global South, neighborhood markets face intensifying pressures from modernization, commercialization, and governance deficits. Systematic measurement tools like the PI empower communities and policymakers to advocate for and achieve place quality improvements grounded in user needs and aspirations. By making placemaking measurable, we make it achievable.

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the current study, along with survey instruments and analysis scripts, are available from the corresponding author upon reasonable request, subject to ethical approval and participant confidentiality protections.

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