Built Heritage

RESEARCH ARTICLE

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Urban Heritage Sociocultural Impact Assessment (UHSCIA): scale development and psychometric validation

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Abstract

This study presents the development and psychometric validation of an urban heritage sociocultural impact assessment (UHSCIA) scale to evaluate the impact of urban development projects on the sociocultural fabric of historic urban precincts. The scale was designed to facilitate a heritage-led approach to urban development, ensuring the preservation and enhancement of urban heritage assets. The study adopts a mixed-method grounded theory to prepare the item pool and construct a framework. The psychometric properties of the scale were rigorously examined through confirmatory factor analysis. The results demonstrate the scale's reliability and validity, affirming its potential as a valuable tool for decision-makers and practitioners involved in heritage-sensitive urban development. The study concludes by discussing the implications of the UHSCIA scale and its scope for future applications.

Keywords Urban heritage, Impact assessment, Scale development, Psychometric validation, Urban development, Sociocultural, Urban revitalisation, Community-centric, Urban heritage values

1 Introduction

Historic urban areas are not only repositories of architectural and cultural heritage but also contribute to the social, economic, and environmental fabric of cities (S Abdurahiman et al. 2022a, b). They embody a community's collective memory, identity, and sense of place, reflecting the cultural and historical evolution of a city over time (Savvides 2015). However, these areas are increasingly vulnerable to the adverse effects of urban development, including the loss of architectural integrity, destruction of historical landmarks, and erosion of cultural values (Shahim Abdurahiman et al. 2022a, b). Urban development projects in historic urban precincts present a complex challenge of balancing growth and modernisation with heritage preservation. The rapid pace of urbanisation necessitates a systematic approach to assess development impacts on urban heritage assets (Shahim Abdurahiman and Kasthurba 2022). Despite the growing recognition of the need to balance urban development with heritage conservation, a significant gap remains in standardised assessment tools for evaluating the sociocultural impact of urban development projects on historic precincts.

The urban heritage sociocultural impact assessment (UHSCIA) scale aims to bridge the gap by providing a structured framework to assess and monitor the impact of development interventions on the sociocultural fabric, potentially a novel approach (Shahim Abdurahiman et al. 2023a). While various impact assessment frameworks exist for environmental and economic dimensions, the sociocultural aspects of urban heritage often lack systematic evaluation methods, leading to inconsistent decision-making processes and potentially irreversible damage to the cultural fabric of historic urban areas. Developing a comprehensive and standardised assessment scale to address these challenges is therefore imperative to enable holistic evaluation that considers

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the diverse dimensions of built heritage, the urban environment, and sociocultural values (Elnokaly and Elseragy 2013).The UHSCIA scale acknowledges that urban heritage impacts unfold across multiple temporal dimensions. Historic urban precincts embody layers of sociocultural evolution accumulated over generations, with each era contributing to the area's character and significance. The assessment must consider both immediate effects and the cumulative influence of interventions over time, recognizing that urban heritage values are dynamic rather than static, shaped by ongoing interactions between physical spaces, social practices, and cultural meanings. This temporal complexity necessitates a framework that captures both immediate impacts and longer-term transformative processes.

The study's primary research question is the following: How can the sociocultural impact of urban development projects on historic urban precincts be systematically assessed and quantified? This overarching question leads to several specific research objectives: (1) to develop a comprehensive framework for assessing the sociocultural impact of urban development projects on historic urban precincts; (2) to identify and validate key indicators and metrics that effectively measure these impacts; and (3) to create a standardised, reliable, and valid assessment tool that can be practically implemented by urban planners, heritage professionals, and decision-makers. The study hypothesises that a multidimensional assessment scale incorporating tangible and intangible heritage values can effectively evaluate the sociocultural impact of urban development projects. This hypothesis is tested through rigorous psychometric validation processes. The study contributes to the field by providing a validated assessment tool that supports evidence-based urban planning and decision-making. It helps identify risks and opportunities, guiding policy-makers towards strategies that preserve and enhance historic precincts' cultural, historical, and physical aspects. The findings can potentially shape policies, planning approaches, and conservation practices, promoting sustainable and inclusive urban development.

2 Literature review

Urban heritage has evolved significantly, from a narrow focus on monument preservation to encompassing broader urban landscapes and their associated cultural values. Historic urban precincts are now recognised as dynamic spaces defined by multiple interrelated values that shape their context (Jain 2023; Azzopardi et al. 2023; Zancheti and Jokilehto 1997). Historic urban landscapes represent the layering of cultural and natural values over time, incorporating both tangible and intangible elements of urban heritage (Bandarin and Van Oers 2012). This evolution has prompted the development of various assessment frameworks to evaluate urban development's impact on heritage areas. Urban regeneration research has increasingly highlighted the importance of incorporating sociocultural elements into revitalisation efforts (Cheshmehzangi 2023). The relationships among urban development, economic aspects, and heritage conservation have been extensively studied. Bandarin and Van Oers (2014) examined how rapid urbanisation affects historic urban landscapes (Bandarin and Van Oers 2014), whereas Pendlebury (2014) analysed the challenges of managing change in historic urban environments (Pendlebury 2014). Rypkema (2014) demonstrated how heritage conservation can contribute to sustainable urban development (Rypkema 2014), and Licciardi and Amirtahmasebi (2012) examined the economic benefits of investing in cultural heritage (Licciardi and Amirtahmasebi 2012). While traditional approaches to heritage impact assessment have focused primarily on physical and economic impacts on historic buildings and monuments, recent scholarship has emphasised the importance of integrating sociocultural dimensions (Shahim Abdurahiman et al. 2022a, b; Shehata 2023). The social and cultural values associated with urban heritage are fundamental to community identity and well-being, yet they are often overlooked in conventional impact assessment methodologies (Tweed and Sutherland 2007). These sociocultural aspects are deeply integrated into community structures and crucial for regional identity (Jain 2023; Shahim Abdurahiman et al. 2024). The sociocultural aspect highlights the significance of intangible qualities in shaping the identity and character of historic urban precincts (Shahim Abdurahiman et al. 2023b). It focuses on community engagement, social cohesion, and cultural awareness that foster a sense of belonging. Emphasising the preservation of local traditions and customs aims to celebrate the unique 'spirit of place.' This aspect also stresses the importance of economic sustainability through heritage tourism and local job creation, striving for a holistic, inclusive environment that enhances residents' well-being and strengthens the cultural identity of these precincts (Shahim Abdurahiman et al. 2024).

Assessment methodologies have been significantly influenced by various frameworks and approaches. Worthing and Bond (2008) proposed a value-based approach to heritage assessment, emphasising the need to consider multiple stakeholder perspectives and various heritage values (Worthing and Bond 2008). This perspective is further supported by Pereira Roders and Van Oers (2014), who advocated for a more holistic approach that considers tangible and intangible aspects of urban heritage (Pereira Roders and Van Oers 2014). De la Torre

(2013) emphasised the importance of developing systematic methodologies for assessing cultural significance and social values in heritage conservation (De la Torre 2013). The sociocultural dimension of urban heritage has become increasingly central to research in recent years. Smith (2015) demonstrated how heritage places contribute to social cohesion, cultural identity, and sense of place (Smith 2015), whereas Waterton and Smith (2010) examined the role of heritage in community engagement and social inclusion (Waterton and Smith 2010). The importance of stakeholder participation in heritage impact assessment has also gained recognition, with Chirikure et al. (2010) emphasising the importance of involving local communities in the assessment process (Chirikure et al. 2010). Jones (2017) further demonstrated how community engagement can enhance the effectiveness of heritage impact assessments (Jones 2017). Quantitative and mixed-method approaches have been developed to assess heritage impacts more comprehensively. Throsby (2012) proposed economic valuation methods for cultural heritage while acknowledging the challenges of measuring intangible cultural value (Throsby 2012). Mason (2002) suggested a mixed-methods approach that combines quantitative indicators with qualitative assessments (Mason 2002). More sophisticated methodological approaches have emerged, with Stephenson (2008) proposing a cultural value model that integrates different types of heritage values (Stephenson 2008) and Fredheim and Khalaf (2016) presenting a comprehensive framework for heritage value typologies (Fredheim and Khalaf 2016). International frameworks have played a crucial role in shaping assessment methodologies. The UNESCO Recommendation on the Historic Urban Landscape (2011) provided a comprehensive framework for integrating heritage conservation into urban development processes (UNESCO 2011), whereas the ICOMOS Guideline on Heritage Impact Assessments (2011) helped establish standardised approaches for evaluating heritage impacts (ICOMOS 2011). However, gaps remain in current assessment methodologies, particularly in developing systematic and quantifiable approaches to measuring sociocultural impacts and integrating different heritage values into comprehensive assessment frameworks. The literature consistently supports the need to develop standardised assessment tools to effectively evaluate tangible and intangible aspects of urban heritage while also incorporating sociocultural dimensions.

3 Methods

The study employs a mixed-method grounded theory approach (MM-GT) (Glaser and Strauss 2017; Howell Smith et al. 2020) to develop and validate the proposed urban heritage sociocultural impact assessment (UHSCIA) scale. Integrating qualitative and quantitative methods ensures a comprehensive assessment of urban heritage impacts. The qualitative component involves the grounded theory methodology to explore the concepts, definitions, and dimensions of urban heritage in the context of historic urban precincts. Expert consultations and in-depth interviews with scholars, practitioners, and policy-makers in the field of heritage conservation provided diverse insights. The iterative data collection process ensures theoretical saturation, leading to a robust conceptual framework for the UHSCIA scale. The quantitative component involves a questionnaire survey administered to heritage experts and urban development professionals. Designed to capture perceptions of sociocultural impacts, the survey includes Likert scale questions and ranking exercises on the basis of qualitative findings. Triangulation of qualitative and quantitative data enriches the analysis, refining the UHSCIA scale to ensure comprehensive coverage of relevant dimensions. Pilot testing and expert feedback helped refine the survey instrument, followed by confirmatory factor analysis to evaluate its psychometric properties. Reliability and validity tests confirmed the scale's internal consistency and robustness, ensuring its effectiveness for heritage-sensitive urban development assessments.

4 Item development

The first phase of the development of the UHSCIA scale involves item development (Fig. 1), which focuses on defining domain dimensions, identifying constructs, and generating measurement items. This phase comprises two subphases: (i) domain identification and (ii) scale item generation. The second phase, scale development (Fig. 2), is discussed later. Domain identification included a literature review and expert consultation to establish key dimensions. Social, cultural, and economic dimensions were identified through deductive content analysis. A pool of items measuring relevant constructs was subsequently generated, refined, and evaluated for redundancy using inductive reasoning. Mixed method–grounded theory (MM-GT) guided the development of the constructs and items.

For the expert interviews, a semistructured protocol was developed on the basis of initial literature review findings, with a focus on urban heritage values, impact assessment methodologies, and conservation challenges. Twenty-five experts with at least 10 years of experience in urban heritage conservation, including conservation architects ($n=10$), urban planners ($n=5$), urban designers ($n=5$), and heritage specialists ($n=5$), were purposively selected. The interviews were conducted between June and December 2023, lasted 60–90 min, were recorded with consent, and were transcribed verbatim.

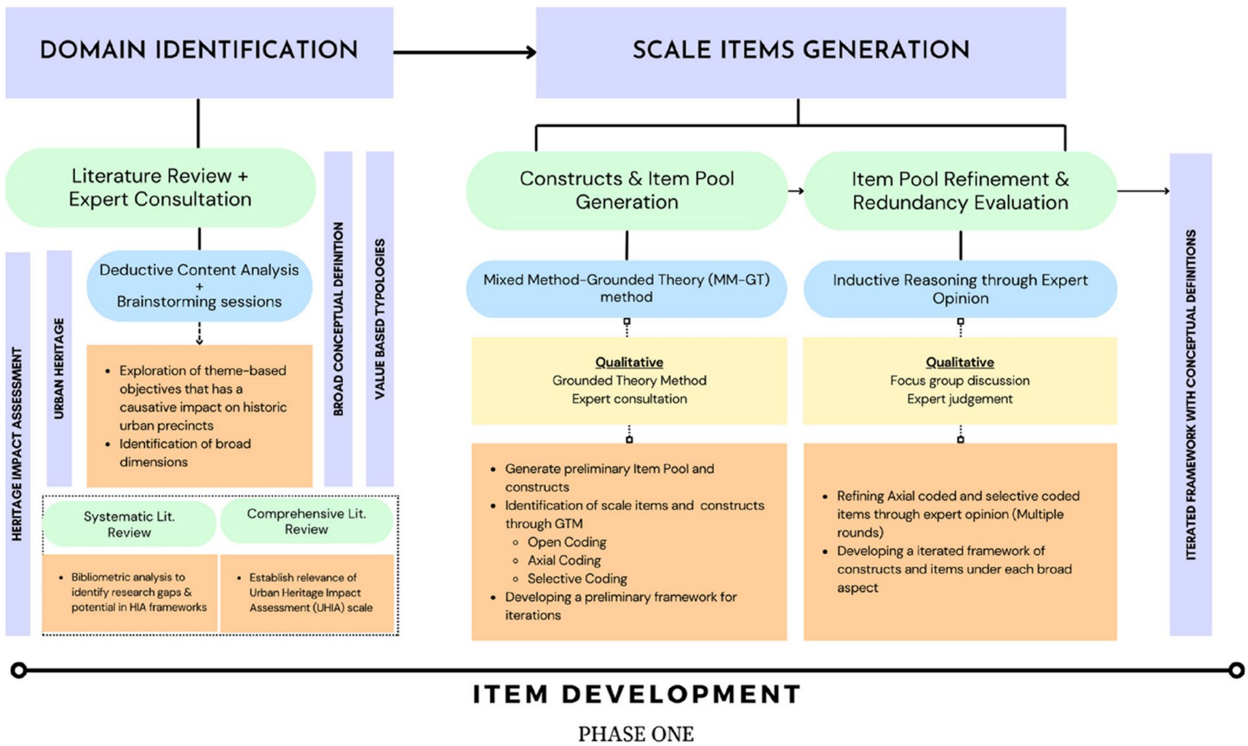

Fig. 1 Item development (Source: the author)

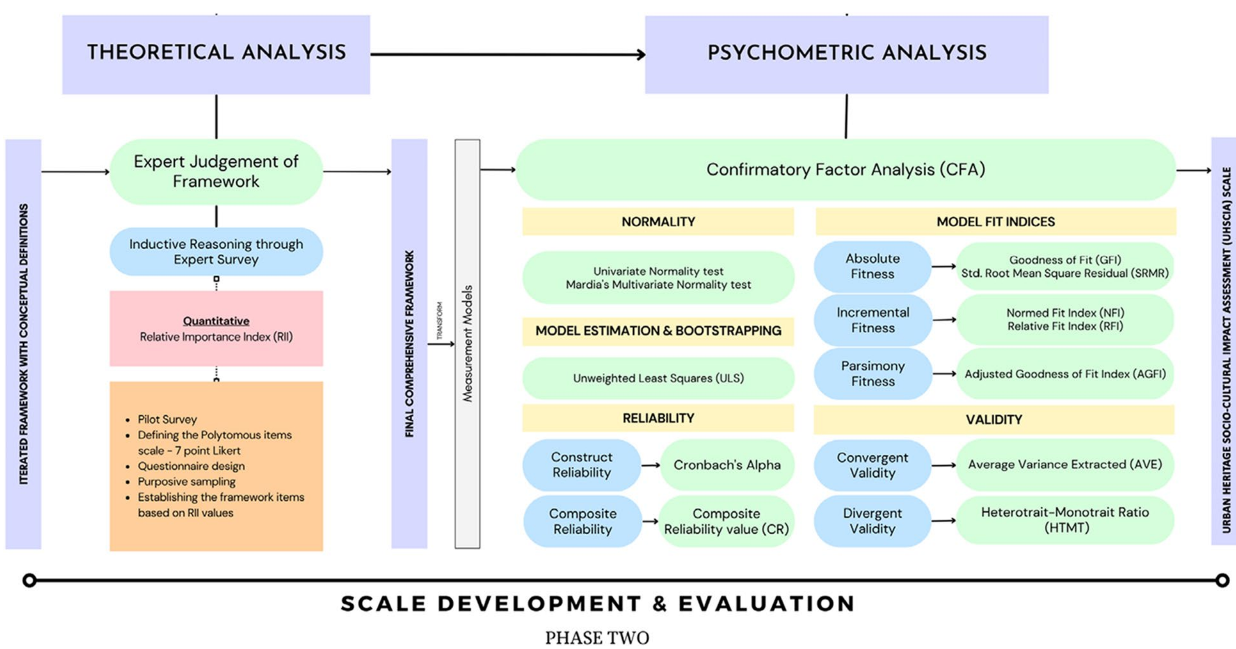

Fig. 2 Scale development (Source: the author)

The coding process was conducted iteratively, with each round of analysis informing subsequent data collection. Initial open coding identified key themes and patterns in the data. Axial coding established relationships between categories, while selective coding integrated these findings into a coherent theoretical framework. Regular team discussions ensured consistency, and coding continued until theoretical saturation was reached. A coding manual was maintained for reproducibility. The semistructured format allowed flexibility while ensuring consistency, with follow-up questions providing deeper insights into urban development and heritage conservation dynamics.

4.1 Framework development

The framework for understanding historic urban precincts encompasses four interconnected constructs that together create a comprehensive approach to preserving and enhancing these vital spaces: sense of place (C1), social cohesion and inclusion (C3), cultural assets and awareness (C3), and local economy (C4). At its foundation lies the sociocultural dimension, which recognises that the identity and character of historic urban areas extend far beyond their physical structures. This aspect emphasises the crucial role of intangible qualities in shaping these spaces, focusing on community engagement, social cohesion, and cultural awareness to foster a genuine sense of belonging among residents and visitors alike. The final items within their respective constructs are presented in Table 1.

The framework's first construct, sense of place (C1), forms the cornerstone of understanding how people connect with historic urban precincts. This construct captures the essence of place-making through several interrelated elements. The concept of genus loci represents the unique spirit or essence that emerges from the historical, cultural, and social character of a space (Gustafsson 2019). This intangible quality works in concert with local experience, manifesting through distinctive lifestyle patterns, daily activities, and social interactions that give each precinct its unique atmosphere (Kusumowidagdo et al. 2023). Place attachment builds upon these elements by recognising the deep emotional bonds that develop between people and their environment, creating a profound sense of belonging (Zhao 2023). The construct is completed by place branding, which involves deliberately developing and promoting a precinct's unique identity to enhance its appeal while maintaining authenticity (Walters and Insch 2018).

Social cohesion and inclusion (C2) expands the framework by addressing the vital community aspects of historic urban precincts. This construct recognises that thriving historic spaces require active community and social engagement, measured through levels of interaction, cooperation, and participation in local decision-making process activities (Pe, Gunawan, and Shieh 2014). The framework acknowledges the importance of multiculturalism in modern urban spaces, celebrating diverse cultural backgrounds (Cui, Gjerde, and Marques 2023) while fostering cultural affiliations that help maintain connections to specific traditions and practices (Azzopardi et al. 2023). Social innovation complements these elements by encouraging creative solutions to community challenges, thereby building resilience and adaptability within these historic spaces (Martins et al. 2023).

The cultural assets and awareness (C3) construct delves deeper into the preservation and promotion of cultural heritage. It recognises intangible cultural assets as crucial elements contributing to a precinct's identity through traditions, customs, and beliefs (Lenzerini 2024). This awareness is strengthened through heritage learning and outreach programs that educate communities about their local history and culture (Lenzerini 2024). Traditional knowledge systems play a vital role in preserving indigenous and local practices passed down through generations (Yan and Li 2023), whereas skill and craftsmanship ensure the continuation of the technical abilities and artistic competencies essential for cultural production (Ocejo 2017).

The framework's final construct, the local economy (C4), addresses the practical aspects of maintaining vibrant historic urban precincts. Sustainable preservation requires economic vitality through diverse job opportunities that provide stable employment options for residents (Kousa et al. 2023). Heritage tourism is a key economic driver while celebrating the precinct's historical and cultural significance (Madandola and Boussaa 2023). Property value considerations help balance preservation with economic development (Yigitcanlar et al. 2019), whereas

Table 1 Sociocultural constructs

Construct	Items
C1. Sense of Place	C11. Genius Loci
	C12. Local Experience
	C13. Place Attachment
	C14. Place branding
C2. Social Cohesion & Inclusion	C21. Community & Social Engagement
	C22. Multiculturalism
	C23. Cultural affiliations
	C24. Social Innovation
C3. Cultural Assets & Awareness	C31. Intangible Cultural assets
	C32. Heritage Learning & Outreach
	C33. Traditional Knowledge Systems
	C34. Skill & Craftsmanship
C4. Local Economy	C41. Job Opportunities
	C42. Heritage Tourism
	C43. Property Value
	C44. Business Incubation

business incubation supports innovation and growth within these historical contexts (Franco et al. 2018).

5 Scale development

5.1 Theoretical analysis

Theoretical analysis involves examining the items in the pool to ensure they are aligned with the measured construct and represent different facets of the construct. This is achieved through an expert judgement of the developed framework and a statistical analysis of the results of the expert survey. A pilot survey was initially conducted, leading to necessary refinements in the questionnaire (De Vaus 2012). An expert questionnaire survey was conducted to aid in establishing the content validity of the instrument framework (Polit and Beck 2006). An expert questionnaire survey was prepared after adopting necessary iterations following a pilot-tested draft that received experts' initial feedback and inputs. Quota sampling was used to select expert participants for the survey. This nonprobability technique involves choosing participants on the basis of specific characteristics to represent a population proportionally. Predetermined quotas for subgroups, such as professional roles, ensure sample diversity (Neyman 1992). A total of 250 experts were identified from various fields, and the survey was conducted online with the data directly fed on Google Forms®. The expected target and achieved quotas for various expert roles outlined in Table 2 suggest that the expert survey's quota sampling was generally effective.

The questionnaire survey is based on a 7-point Likert scale that captures the experts' opinions of the relative importance and impact of an item on its construct. The collected data were analysed using questionnaire responses, and the relative importance index (RII) values were calculated. Tables 3 and 4 display the RII values, global RIIs and ranks for the main constructs and their respective items. To conduct a confirmatory factor analysis (CFA) with valid results, the sample size should correspond to the number of variables in the constructs. In general, at least 200 cases are recommended for CFA. The study's structure includes 16 items. For initial construct exploration, 5 to 10 participants per item are advised (Myers et al. 2011). Therefore, a sample size of 160 or more, following a 1:10 ratio, is considered adequate. After quota sampling, 237 experts expressed a willingness to participate, meeting the criteria for a successful CFA.

Table 2 Expected target quota–expert selection

Field of Expertise	Expected Quota		Achieved Quota	
Conservation Architect	40%	100	43.2	102
Architect	20%	50	21.9	52
Urban Designer	20%	50	17.3	41
Urban Planner	10%	25	10.1	24
Heritage Specialist/Historian	5%	25	4.2	10
Archaeologist			0.8	2
City Planner	5%		1.7	4
Regional Planner			0.8	2
Total		250	100%	237

Table 3 Relative importance index (RII) constructs

Construct	RII	Rank
C1. Sense of Place	0.8427	4
C2. Social Cohesion & Inclusion	0.8957	2
C3. Cultural Assets & Awareness	0.9337	1
C4. Local Economy	0.8758	3

5.2 Psychometric analysis–confirmatory factor analysis

The data collected from the expert survey underwent psychometric analysis to evaluate the reliability and validity of the scale. Confirmatory factor analysis (CFA) (Jöreskog and Sörbom 1981) was employed to perform psychometric analysis, thereby assessing reliability and validity. The main objective is to determine the extent to which the observed items are related to the constructs and to assess whether the hypothesised model fits the data. SPSS AMOS (Arbuckle 2013, 226–229) was used to conduct CFA. The hypothesised model for developing the urban heritage sociocultural impact assessment (UHS-CIA) scale comprises four main latent constructs. Each

Table 4 Relative importance index (RII) items

Items	RII	GRII	Rank
C11. Genius Loci	0.9445	0.7959	9
C12. Local Experience	0.9445	0.7959	8
C13. Place Attachment	0.9036	0.7614	14
C14. Place branding	0.8969	0.7558	15
C21. Community & Social Engagement	0.9397	0.8417	5
C22. Multiculturalism	0.9228	0.8266	7
C23. Cultural affiliations	0.9470	0.8482	4
C24. Social Innovation	0.8523	0.7634	13
C31. Intangible Cultural assets	0.9662	0.9022	1
C32. Heritage Learning & Outreach	0.9385	0.8763	3
C33. Traditional Knowledge Systems	0.9427	0.8802	2
C34. Skill & Craftsmanship	0.8855	0.8268	6
C41. Job Opportunities	0.8873	0.7771	11
C42. Heritage Tourism	0.8837	0.7739	12
C43. Property Value	0.8975	0.7861	10
C44. Business Incubation	0.8457	0.7407	16

latent construct is further defined by a set of observed indicators, which are the qualitatively measurable variables that help assess the impact of urban development proposals on the historic urban fabric. The measurement models for each construct are taken individually to perform reliability and validity tests and check model fitness.

5.2.1 Model estimation

Given that the Likert scale, which often produces ordinal data, is used for data collection, achieving a normal distribution is unlikely, even with a sample size of 237 for CFA. Univariate normality is particularly challenging with Likert scale responses. In cases where data are not normally distributed, the literature recommends the use of the unweighted least squares (ULS) model estimation technique for CFA (Zulkifli et al. 2023). The measurement models and path diagrams are shown in Figs. 3 and 4. The factor loadings are presented in Table 5.

5.2.2 Model fitness assessment

Model fitness assessment was conducted to determine how well the model fits the observed data and whether it accurately represents the underlying latent constructs being measured by the observed indicators (Smith and McMillan 2001). In confirmatory factor analysis (CFA), different categories of fitness indices are commonly used to assess the adequacy of a specified measurement model for the observed data. These categories include absolute (Ullman and Bentler 2012), incremental, and parsimony-based fit indices (Smith and McMillan 2001). Only the fitness indices applicable to the ULS estimation method were assessed (Table 6). Absolute indices measure fit against an ideal model, incremental indices compare the specified model with a null model, and parsimony-based indices evaluate model simplicity (Ullman and Bentler 2012). According to these fit indices, the model generally shows a good fit, with indices above acceptable thresholds.

5.2.3 Reliability tests

The construct reliability (Cronbach 1951) was established from the expert survey conducted in the theoretical analysis. All the items yielded a Cronbach's alpha value greater than 0.75, indicating strong internal consistency within item sets (Nunnally and Bernstein 1978); hence, the construct validity of the constructs and their respective items was established, and the composite reliability was calculated for each construct, which is shown in Table 7. In general, composite reliability values of 0.7 or higher are considered acceptable for research purposes. Table 7 shows that all the constructs exhibit a CR value greater than 0.7, establishing composite reliability.

5.2.4 Validity tests

The survey was formulated and designed to assess the content validity (Polit and Beck 2006; Lynn 1986; Lawshe 1975) of the prepared UHSCIA comprehensive structure through an expert opinion survey. The experts were required to nominate a value to determine the importance of each item relative to its construct. The results of the RII values for all three aspects are shown in Tables 2 and 3, which indicate high RII values, establishing the content validity of the constructs and their respective items.

Convergent validity was estimated using the average variance extracted (AVE) (Fornell and Larcker 1981) for each construct, as shown in Table 8. The AVE for a construct should ideally be at least 0.5 or higher, indicating that at least 50% of the variance in the indicators is explained by the construct (Hair et al. 2010). Except for

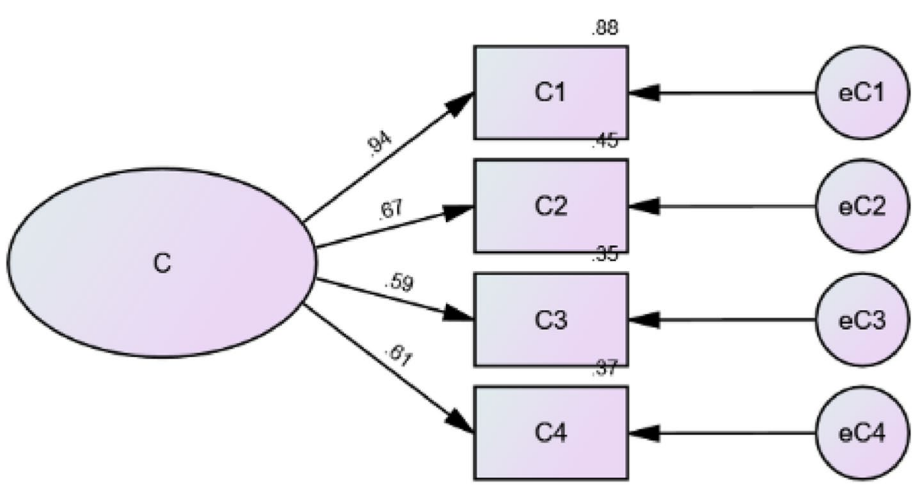

Fig. 3 Measurement model (Source: the author)

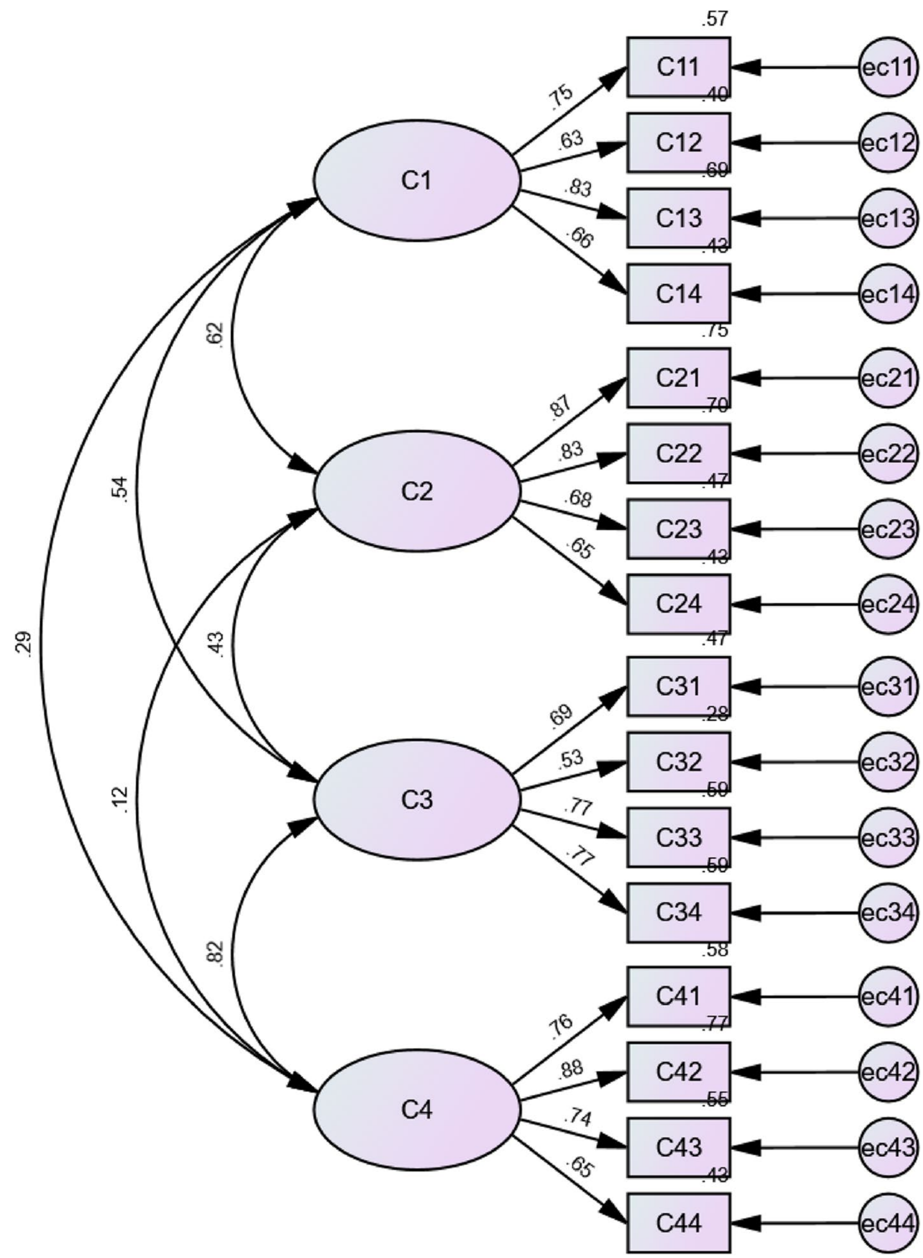

Fig. 4 Path diagram (Source: the author)

C3, all the constructs present an AVE value greater than 0.5. No deletion of items was conducted for C3, as the AVE value obtained was 0.485, which is very close to 0.5, and the CR value obtained was greater than 0.7. Therefore, overall, convergent validity is established.

Discriminant validity was assessed via the heterotrait–monotrait (HTMT) ratio method (Henseler et al. 2015; Fornell and Larcker 1981). All the constructs within each of the three aspects showed discriminant validity, with all the HTMT ratio values less than 0.9 (Henseler et al. 2015). The HTMT ratio calculations for the constructs are shown in Table 9.

The bootstrapping analysis, conducted with IBM SPSS AMOS 23, employed 5000 samples, 95% bias-corrected confidence intervals, and ULS estimation. All samples proved usable with no covariance or solution issues, indicating model stability. Bootstrap standard errors for regression weights (Table 10) and bias-corrected percentiles for sociocultural elements (Table 11)

Table 5 Factor loadings

Factor	Estimate	Std. Estimate	Items	Estimate	Std. Estimate
C1	1.000	.936	C11	1.000	.753
			C12	.705	.631
			C13	1.373	.832
			C14	1.103	.659
C2	.670	.671	C21	1.000	.867
			C22	.970	.834
			C23	.722	.682
			C24	.870	.653
C3	.439	.589	C31	1.000	.686
			C32	.951	.533
			C33	1.293	.769
			C34	1.864	.771
C4	.586	.612	C41	1.000	.763
			C42	1.112	.879
			C43	0.7861	10
			C44	0.7407	16

Table 6 Model fitness indices

	Absolute		Incremental		Parsimony
CMIN	GFI	SRMR	NFI	RFI	AGFI
38.22	.955	.0946	.929	.914	.937

Table 7 Cronbach's alpha (α) and CR values

Item	Cronbach's Alpha (α)	(α) after item deletion	CR
C1	.799	-	0.812
C2	.840	.845 | C24	0.847
C3	.784	.788 | C34	0.787
C4	.845	-	0.848

Table 8 AVE values of the constructs

Construct	AVE	Construct	AVE
C	0.512	C1	0.523
		C2	0.584
		C3	0.485
		C4	0.584

Table 9 HTMT table

	Monotrait Correlation			
C1	0.515			
C2	0.573			
C3	0.473			
C4	0.576			
	Heterotrait correlation			
	C1	C2	C3	C4
C1				
C2	0.339			
C3	0.267	0.226		
C4	0.156	0.067	0.430	
	Heterotrait–Monotrait (HTMT) Ratio			
	C1	C2	C3	C4
C1				
C2	0.625			
C3	0.540	0.434		
C4	0.287	0.116	0.824	

Table 10 Bootstrap standard errors for standard regression weights

Parameter	SE	SE-SE	Mean	Bias	SE-Bias
C11	.042	.000	.750	-.003	.001
C12	.056	.001	.629	-.002	.001
C13	.039	.000	.833	.001	.001
C14	.051	.001	.660	.002	.001
C21	.046	.000	.863	-.004	.001
C22	.042	.000	.833	-.001	.001
C23	.057	.001	.684	.001	.001
C24	.046	.000	.653	.000	.001
C31	.045	.000	.684	-.003	.001
C32	.053	.001	.535	.002	.001
C33	.040	.000	.769	.000	.001
C34	.037	.000	.771	-.001	.001
C41	.040	.000	.764	.000	.001
C42	.030	.000	.878	-.001	.000
C43	.047	.000	.743	-.002	.001
C44	.041	.000	.652	-.002	.001

showed minimal bias and small standard errors. All factor loadings were statistically significant ($p < 0.001$), with no confidence intervals containing zero, confirming the model's structural accuracy and generalizability.

6 Final weighted UHSCIA scale

In the scale development process, factor loadings for each item on their respective constructs were determined. Factor loadings represent the strength of the relationship between the items and their underlying constructs. Higher factor loadings indicate a stronger association between the item and the construct it represents. The product of the factor loadings of the construct and their respective items yielded the final weight for each item. Hence, each item's contribution

Table 11 Biased-corrected percentile–sociocultural items

Parameter	Estimate	Lower	Upper	p
C11	.753	.666	.829	.000
C12	.631	.510	.730	.000
C13	.832	.750	.906	.001
C14	.659	.545	.750	.001
C21	.867	.773	.951	.000
C22	.834	.751	.915	.000
C23	.682	.550	.783	.001
C24	.653	.557	.736	.001
C31	.686	.593	.770	.000
C32	.533	.424	.631	.001
C33	.769	.685	.841	.000
C34	.771	.695	.839	.000
C41	.763	.678	.835	.001
C42	.879	.817	.937	.000
C43	.745	.651	.834	.000
C44	.654	.568	.731	.000

to the overall UHSCIA score is determined by its global weight. The higher the factor loading, the greater the weight an item carries within its construct and more broadly. By aggregating the weighted scores of individual items, the UHSCIA scorecard generates the UHI score for each construct within each aspect. This allows for a comprehensive understanding of the impact of the urban development proposal on sociocultural elements. The final weighted UHSCIA scale is shown in Table 12.

7 Discussion

The UHSCIA scale's development and validation process revealed several critical conflicts between urban development imperatives and heritage conservation goals. These tensions emerge at multiple levels and require resolution mechanisms to ensure sustainable urban development while preserving cultural heritage values. A primary source of conflict arises from competing economic pressures and conservation needs in historic urban precincts. The local economy construct (C4) highlights how development initiatives often prioritise commercial viability through increased property values (C43) and business incubation (C44), potentially threatening the authentic character of historic areas. This economic–preservation tension manifests particularly where modern business requirements necessitate significant structural modifications to heritage buildings or where increased property values lead to gentrification, potentially displacing traditional communities and practices. The social cohesion and inclusion construct (C2) reveals another critical area of conflict where contemporary urban development objectives may clash with the existing social fabric. While development projects often aim to enhance community engagement (C21) and promote social innovation (C24), these initiatives can inadvertently disrupt established social networks and cultural affiliations (C23). The cultural assets and awareness dimension (C3) highlights conflicts between modernisation and the preservation of traditional knowledge systems (C33) and craftsmanship (C34), particularly where new construction or adaptive reuse projects fail to accommodate

Table 12 Weighted UHSCIA scale

Code	Construct	Code	Variables	Global Weight
C1	Sense of Place	C11	Genius Loci	0.705
		C12	Local Experience	0.591
		C13	Place Attachment	0.779
		C14	Place Branding	0.617
C2	Social Cohesion & Inclusion	C21	Community & Social Engagement	0.582
		C22	Multiculturalism	0.560
		C23	Cultural Affiliations	0.458
		C24	Social Innovation	0.438
C3	Intangible Assets & Awareness	C31	Intangible Cultural Assets	0.404
		C32	Heritage Learning & Outreach	0.314
		C33	Traditional Knowledge Systems	0.453
		C34	Skill & Craftsmanship	0.454
C4	Local Economy	C41	Job Opportunities	0.467
		C42	Heritage Tourism	0.538
		C43	Property Value	0.456
		C44	Business Incubation	0.400

traditional practices. Several resolution mechanisms can be integrated into the UHSCIA framework's application to address these conflicts. The scale can establish clear thresholds for acceptable change and enable nuanced evaluation of trade-offs between heritage value and development needs. The scale's comprehensive coverage supports adaptive management strategies through phased implementation and regular monitoring of impacts. Successful conflict resolution often requires a combination of regulatory mechanisms, economic incentives, and community-based initiatives, which the UHSCIA scale can support by providing quantifiable metrics for monitoring intervention strategies.

The sociocultural dimension encompasses criteria such as sense of place, social cohesion and inclusion, intangible assets and awareness, and the local economy. Items have global weights ranging from 0.314 to 0.779. Psychometric analysis reveals strong interconnections within urban heritage, with key findings informing policy and practice. Within sense of place, place attachment (C13) holds the highest weight (0.779), emphasising the role of emotional and psychological connections in historic areas. This highlights the need for policies that enhance traditional gathering spaces, landmarks, and cultural venues. In social cohesion and inclusion, community engagement (C21) has a strong loading (0.582), reinforcing the importance of participatory urban development. The lower loading for social innovation (C24) (0.438) suggests that innovation should complement, not override, traditional social structures. The cultural assets and awareness dimension presents a nuanced view. Traditional knowledge systems (C33) and skill and craftsmanship (C34) have similar loadings (0.453, 0.454), underscoring their equal significance in heritage authenticity. However, heritage learning and outreach (C32) has a lower loading (0.314), indicating a gap in heritage education efforts. In the local economy, heritage tourism (C42) (0.538) is a key economic driver, but balanced loadings across job opportunities (C41, 0.467) and property value (C43, 0.456) suggest the need for a diversified economic strategy. These findings underscore the need for an integrated approach to urban heritage conservation that balances physical preservation with sociocultural sustainability. Strong place attachment and community engagement suggest that maintaining cultural continuity should be a policy priority. While tourism plays a significant role, a diversified economy is essential for long-term sustainability. The lower loadings for heritage learning and social innovation indicate these areas need further attention, calling for improved education and engagement strategies. This study argues that conservation should preserve both tangible and intangible heritage, ensuring that historic areas retain their distinctive character.

While the quota sampling approach ensures representation from various professional fields, a limitation of the current study is its predominant focus on architects and urban planning professionals. The expert sample, although technically diverse, was heavily weighted towards architectural and planning perspectives, potentially overlooking valuable insights from other stakeholder groups. Future iterations of scale development could benefit from broader stakeholder participation, including community residents, cultural event organisers, local business owners, and heritage tourism operators. Their lived experiences and practical insights could provide additional dimensions to the assessment framework, particularly in evaluating sociocultural impacts. This expansion of stakeholder participation aligns with the scale's ultimate goal of comprehensive heritage impact assessment. Future applications of the UHSCIA scale may consider not only individual indicator weights but also their interactive effects on overall outcomes. This could be achieved through enhanced analytical frameworks using structural equation modelling or network analysis. These interrelationships are important for practitioners and decision-makers, because changes in one dimension can affect others. For instance, heritage tourism initiatives may influence not only economic indicators but also social cohesion and cultural awareness. The scale could be improved by incorporating a temporal dimension through a dynamic adjustment framework that tracks how impacts evolve. This would account for gradual sociocultural changes and feedback loops between physical interventions and community responses. Key considerations include impact lag time, threshold effects, interactions between multiple projects, and community adaptation capacity. Regular monitoring protocols would help detect cumulative effects and allow for refining impact assessments on the basis of observed outcomes.

While the expert-based approach to weight assignment provides a strong theoretical foundation, additional empirical validation is needed. Weights derived from expert opinions should be tested against real-world impact data from completed urban development projects in historic precincts. Future research should collect longitudinal data on sociocultural outcomes, enabling statistical analysis of the relationship between assigned weights and measurable impacts. This process could track changes in community engagement, cultural preservation, and economic indicators, refining the weighting system to better reflect urban heritage preservation and community well-being. Despite its strong psychometric properties, implementing the UHSCIA scale presents challenges. Data collection in historic precincts is often fragmented, and assessing intangible aspects, such as sense of place, requires extensive fieldwork. Ensuring consistent data across diverse urban contexts is difficult because of variations in heritage interpretations. Community involvement, while essential, may face obstacles such as stakeholder fatigue and conflicts of interest. The scale also requires periodic updates to remain relevant amid demographic and cultural shifts. Institutional barriers, including resource limitations and resistance from development stakeholders, further complicate implementation. Integrating the scale into urban planning requires strategies for capacity building, simplified tools for engagement, and clear guidelines for data collection and interpretation. Future research should address these challenges to enhance its applicability. While the current study establishes the theoretical foundation and validates the measurement instrument, the operationalisation in real-world situations has yielded positive outcomes that merit separate detailed discussion. This strategic separation of scale development and practical implementation allows for comprehensive treatment of both aspects, ensuring that each aspect receives the detailed attention necessary for meaningful contributions to both theory and practice.

8 Conclusion

The urban heritage sociocultural impact assessment (UHSCIA) weighted scale is a comprehensive framework for evaluating the various aspects and criteria that contribute to the sociocultural value of a historic urban area. The UHSCIA scale offers a standardised and comprehensive approach to assess the sociocultural impact of urban development projects on historic urban precincts. The development and psychometric validation of the UHSCIA scale represent a significant contribution to the field of urban heritage conservation and management. Its psychometric validation ensures its reliability and validity, providing confidence in its application in real-world contexts. Factor analysis revealed distinct dimensions within the scale, capturing key aspects of built heritage, the urban environment, and sociocultural values. The scale demonstrated high internal consistency, indicating the reliability of the items. Additionally, construct validity was established through correlations with relevant external variables, confirming the scale's ability to measure the intended constructs. Its psychometric validation ensures its reliability and validity, providing confidence in its application in real-world contexts. The scale enables decision-makers, urban planners, and heritage professionals to evaluate and compare different development proposals, ensuring heritage-sensitive urban development that preserves the character, cultural identity, and heritage values of historic urban areas. This study focused on the scale development and evaluation of the proposed UHSCIA scale. The UHSCIA weighted scale provides a valuable tool for assessing and understanding the significance of various factors in urban heritage conservation and development. By assigning global weights to each variable, the framework allows for a more objective and comprehensive evaluation of urban heritage assets, ultimately helping decision-makers prioritise and address the most critical aspects of heritage conservation and management. The scale offers a reliable and comprehensive tool for assessing the impact of urban development on historic urban precincts, enabling informed decision-making and fostering heritage-led urban development practices. The scale's application holds immense potential to facilitate sustainable and culturally vibrant cities that embrace their unique heritage assets. Further research and application of the UHSCIA scale are encouraged to advance heritage-sensitive urban development worldwide.

The study concludes with the potential of deriving recommendations and guidelines from the developed assessment scale, assisting policy-makers, conservation architects, urban designers, architects, and urban planners in determining the most feasible development project that maintains the historic urban precinct's sociocultural character, identity and values. The developed scale serves as a comprehensive database for researchers to refer to for future research. The scale also serves the community by enabling them to recognise the associated values and engage them inclusively in decision-making rather than opting for incongruous development. Directions for the future scope of research and iterated practices for heritage-sensitive urban development in historic areas in the context of urban conservation were discussed.

Abbreviations

AGFI	Adjusted goodness-of-fit index
AMOS	Analysis of moment structures
AVE	Average variance extracted
BC	Bias-corrected
CFA	Confirmatory factor analysis
CMIN	Chi-square minimum
CR	Construct reliability
GFI	Goodness-of-fit index
GRII	Global relative importance index
HTMT	Heterotrait–monotrait
IBM	International Business Machines
ICOMOS	International Council on Monuments and Sites
MM-GT	Mixed method–grounded theory
NFI	Normed fit index
RII	Relative importance index
RFI	Relative fit index
SE	Standard error
SPSS	Statistical Package for the Social Sciences
SRMR	Standardised root mean square residual
UHI	Urban heritage impact
UHSCIA	Urban heritage sociocultural impact assessment

ULS Unweighted least squares
UNESCO United Nations Educational, Scientific and Cultural Organization

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