JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Urban design and planning: Aesthetics current trends for visual city quality, systematic review

DOI: https://doi.org/10.5281/zenodo.15512533

[1.]Taiwo Atoro, [2.]Oluwaseun Princess Okimiji, [1.]Adewale Yoade, & [4.]Rotimi Olaleye

[1.]*Department of Urban and Regional Planning, Faculty of Environmental Sciences, Lagos State University P.M.B 0001 Lagos State, Nigeria*
[2]*Department of Environmental Management, Faculty of Environmental Sciences, Lagos State University P.M.B 0001 Lagos State, Nigeria*
[4]*New Town Development Authority, Lagos State, Nigeria*

Abstract

The research explores and reviews studies on the concepts of aesthetics, emphasizing emerging patterns in urban planning, environmental friendliness and adaptability, user-oriented design, and technological advancement. This study uses document review data collection methods with multiple case studies designs via explanatory and collective case studies of past research, to evaluate how aesthetics influence new trends and to look at examples where aesthetics have been successfully included in urban design. This literature study highlights how current trends in aesthetics positively impact the visual quality of cities. The method effectively addressed green infrastructure, environmentally conscious architecture, urban planning that responds to climate conditions, and sustainable modes of transportation. Furthermore, the key aspects include place-making and community participation, inclusive design and accessibility, as well as considerations for well-being. The results demonstrate that building design must provide sufficient space to accommodate this cultural activity and way of life. Culture should steadfastly resist succumbing to the temptation of architecture and its requirements, even if both are inherently dynamic and will evolve towards improvement. Research indicates that assessing the potential of biophilic design, planning, and policy to tackle future global concerns related to human survival on Earth is necessary. The study's findings suggest that contemporary urban design is progressively embracing a new framework to incorporate sustainability by enhancing our comprehension of the interplay between humans and nature in urban environments.

Keywords: Urban planning, Aesthetics, Visual quality, Technological trends.

1. Introduction

The aesthetics of urban environments are significantly influenced by the effective design of its physical attributes or urban form. The characteristics of urban form are dictated by the attributes of its essential components, and the quality of urban form affects human perception and visual intricacy (Boeing, 2018). Urban aesthetics are significantly associated with "excellent visual complexity," which relies on diversity in architectural styles, design elements, street furnishings, signage, human activity, illumination and shadow, as well as the textural characteristics of street trees and urban open areas (Huq et al., 2018). Furthermore, effective urban design is essential for enhancing the health of a city's inhabitants, as well as promoting walkability, cycling, and interaction with open and green spaces (Bahrainy and Khosravi, 2013). Aesthetics possesses a profound historical context and has experienced considerable evolution over time. Aesthetics in

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



urban development has frequently been eclipsed by functional and economic factors, resulting in the homogenisation and commodification of the modern urban landscape (Farina-Tojo, 2015; Lefebvre, 2013; Munoz, 2008; Pellitero, 2011).

Studies indicate that environmental attributes, including natural areas and fractal-rich elements, evoke aesthetic appreciation in humans, and these traits are frequently evident in traditional architecture designs (Brielmann et al., 2022; Lavdas and Schirpke, 2020; Taylor, 2021). The significance of aesthetics in urban planning is underscored by the favourable correlation between aesthetics and well-being (Aziz Amen and Nia, 2018; Amen and Kuzovic, 2018; Amen and Nia, 2021; Aziz Amen, 2017).

As a result, the duty of designing and moulding the urban landscape has frequently been assigned to private organisations. Private economic agents identify places lacking investment for capital infusion through initiatives aimed at rehabilitating and enhancing landscapes or developing urban spaces. Capitalism, especially via developmental and neoliberal strategies, has converted urban space into a mere commodity (Lefebvre, 2013), enabling its exploitation for capital accumulation. Treating urban space as a commodity has facilitated worldwide replication (Jiménez et al., 2018). Jiménez et al. (2018) assert that mass production culminates in homogenisation, yielding a standardised model—the generic city (Koolhaas, 2006). The significant transformations characterised by "settlement dispersion, building waste, and the resultant obliteration of natural [and cultural] heritage" (Sargolini, 2013) have obliterated our intrinsic connection to "urbane" and "humane" environments that sustain the livelihoods and dignity essential to human existence. This has resulted in a condition of nostalgia, solitude, and ambiguity that we occupy with shame (Lepore, 2020; Rowe and Barber, 2018).

Cities frequently exhibit disparities in access to green spaces, with semi-natural regions situated far from urban centres, and suburban and peripheral recreational areas that are generally scarce, of inferior quality, and frequently polluted, deteriorated, or neglected (Liotta et al., 2020; Ta et al., 2020). Urban environments and their landscapes no longer serve as accurate representations, only mirroring global tendencies in modern urbanism with few local adaptations (Caymaz and Hamameh, 2020). Consequently, the phenomenon of unregulated expansion and gradual fragmentation defining the modern city (Pellitero, 2011) has resulted in

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



a patchwork of indistinct and bland urban spaces that have forfeited their sense of place. These challenges prompt enquiries into progress, urban aesthetics, social equity, and the quality of life in our daily interactions with the environment. This exploration aims to reevaluate the ethical responsibilities and principles in combating the widespread decline of aesthetic qualities and identities within the urban landscape, contrasting with Vaughan's (1987) observation of "a proliferation of styles with the divergence of intents" competing for dominance, amidst a lack of consensus or common ground. The analysis of aesthetic experience should not rely on arguments for an objective truth but instead on "common principles that underlie apparent chaotic diversity" (Orians, 1986).

This study aims to reveal the gaps that offers a scientific foundation which comprehend the tangible built environment through the lens of urban aesthetics and explore the impact of alterations in built forms on urban aesthetics through existing studies. The primary objectives of this study are: (i) to create an expert-driven trans-disciplinary literature review that serves as the theoretical foundation for our approach to urban aesthetics characterisation; and (ii) to pinpoint significant deficiencies in green building standards and smart city evaluations regarding their consideration of emerging trends in urban design. Furthermore, in relation to urban design and the enhancement of environmental quality, it is essential to increase both objective and subjective aesthetic attributes (visual-form and conceptual-cognitive characteristics) in urban public spaces, as this is vital for creating coherent and distinctive cities.

2.0. Literature Review

Urban aesthetics serves as a means of city identity and is a crucial element in evaluating the dynamics of urban environments (Nia, 2021). Assessing a city as "beautiful" entails evaluating its architectural styles, design intricacies, and the impacts of traffic, noise, and pollution, alongside the social dynamics among its residents and the calibre of these interactions (Nia, 2021). The aesthetic value of urban spaces should evoke pleasure, personal reflection, relaxation, and observation (Philipp et al., 2002). Consequently, based on the positive correlation between environmental pleasure and urban aesthetics, Stamps (2000) emphasised the importance of research on the aesthetic qualities of the perceived environment.

Hence, Jon Lang is a significant character in the discourse on urban aesthetics. Lang (1987),

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



referencing the initial classification of aesthetics proposed by Santayana (1955), delineated aesthetics into two primary categories: Formal Aesthetics and Symbolic Aesthetics. Formal aesthetics pertains to the "appreciation of structures and shapes for their intrinsic value" and is intricately linked to Gestalt Theory of Perception, whereas symbolic aesthetics pertains to the meanings suggested by environmental patterns that elicit pleasure (Lang, 1987).

Notwithstanding, the aesthetic discourse surrounding public spaces provides an alternative perspective, distinct from the pedestrian-centered approach that engages with the physical experience of public environments. Similarly, McGlynn et al. (1985) identified additional complementary factors, including legibility, variety, personalisation, permeability, visual appropriateness, robustness, and richness, as attributes of public spaces. In contrast, Jacobs and Appleyard (1987) emphasised environmental qualities such as urban self-reliance, community life, liveability, identity, access, and authenticity. However, the primary dimensions influencing aesthetic urban quality can be categorised into two segments: (a) objective, physical, or expert-based, and (b) subjective, psychological, and reliant on public preference. The research indicated that the goal components of aesthetic urban space configuration can be categorised into two segments (Nia, 2021). The initial segment, concerning the tangible and objective components of urban structure, can be further categorised into macro and micro dimensions. The second classification seeks to systematically arrange the objective components of urban spatial configuration (Nia, 2021).

Acknowledging the interplay between human requirements and environmental aesthetics in urban contexts, Stamps (2000) advocated for additional research on the quality of the perceived environment. Tiesdell and Carmona (2007) underscored the importance of aesthetics as a facet of urban design within the design process. The aesthetic value of spaces correlates with users' evaluations of them. Observers assess their perception of a location favourably or unfavourably depending on its aesthetic appeal (Bell et al., 2001). Urban aesthetics embodies the quality of life with the socio-economic, cultural, and physical dimensions of urban planning. Furthermore, multiple research spanning several fields, such as urban studies and aesthetics, illustrate the relationship between urban planning and aesthetics (Wang et

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



al., 2019; Welsch, 1997). Aesthetic theories delineate the methodologies for aesthetic planning. An aesthetic planning approach is more effective and contextually relevant when advantageous frameworks are established to examine the values of urban space, particularly within pragmatist and phenomenological philosophies (Hourakhsh and Fashuyi, 2020). In this context, planning theory, the foundation for aesthetic planning (Wilson, 1996), is frequently viewed in relation to the planning process, connecting to the theories of planning and its subjects.

In this regard, modern planning predominantly favours procedural ideas, whereas urban design and architectural theories uphold a more subjective planning framework. All deliberate actions, regardless of whether they are derived from objective methodologies or subjective frameworks, frequently have unforeseen outcomes. The consequences stem from the deficiencies in the foundational principles underlying the decisions (Munasinghe, 2001). From a pragmatist viewpoint, where products and their associated processes are interrelated, the aesthetic enhancement of urban space equates to urban development (Ratcliffe et al., 2004). The 1960s witnessed a paradigm change in planning, bifurcating it into two distinct schools of thought: one perceiving planning as a pedagogical method for goal attainment, and the other as a theory-driven systemic perspective (Munasinghe, 2001). Subsequently, the aesthetics of public urban spaces have gained significance in cities marked by static urban imagery or picturesque townscapes, as well as in the social lives of individuals, their environments, and urbanism processes (Munasinghe, 2001). Emphasising the importance of urban aesthetics from a phenomenological perspective is pertinent to this study. Nonetheless, aesthetics is predominantly overlooked in urban environmental planning. The dual role of the designer and urban planner—as organiser, enabler, and regulator—appears to contribute to the improvement of aesthetics in urban planning initiatives. Consequently, the subsequent section will thoroughly examine the historical context and development of aesthetics.

2.1 Historical Perspective on the Evolution of Aesthetics

Aesthetics is a discipline that seeks to comprehend the essence of beauty and the philosophical underpinnings of art (Real Academia Española, 2022; Collins, 2022). The etymological origins of the term can be traced to the ancient Greeks (Bayer, 1961/2014), but

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



its recognition as a unique field emerged in the 18th century, largely thanks to the significant contributions of German philosopher Alexander Gottlieb Baumgarten (Bayer, 1961/2014). The examination of aesthetics predates its establishment as a scientific discipline, as demonstrated by the artistic activities of prehistoric humans who created artefacts and visual media with intrinsic aesthetic value (Campos Bueno, 2010).

More so, aesthetics has been moulded and reinterpreted by numerous philosophical theories and movements over the years. Aesthetics, from Greek philosophy through the Middle Ages and Renaissance to the mid-18th century, principally focused on the consideration of sensory experience and beauty (Masiero, 2018). German philosophers Baumgarten and Kant were instrumental in founding aesthetics as a distinct discipline that explored the connection between art and beauty (Bayer, 1961/2014; Soto-Bruna, 1987). Hence, the decoupling of beauty and aesthetics commenced at this juncture (Moratiel, 2018). In the 19th century, this separation intensified, prompting a reevaluation of aesthetics that incorporated its antithesis, ugliness (Calvo Fernández, 2018). Notwithstanding this recent preoccupation with the grotesque, the conventional standard of beauty and its connection to aesthetics endured (Calvo Fernández, 2018). Avant-garde groups did not develop until the 20th century, advocating for the demise of beauty and the unrestrained expression of art, including aesthetics (Bayer, 1964/2014). Additionally, the subsequent part will examine the idea of urban aesthetic space production utilised in the study.

2.2 Space production theory and Schema Theory adopted for the study

Space production theory

Space production theory posits that the urban landscape possesses three characteristics: spatiality, timeliness, and sociality (Soja, 1999). Nonetheless, distinctions exist between subjective experience and the actual reality. Aesthetic perceptions of the urban landscape are not solely based on the objective surroundings but are mediated by individual perception and experience. Canadian researcher Julian Smith identified a shift from "visual-based" to "experience-based" paradigms when contrasting 20th-century modern architecture with 21st-century postmodern architecture (Smith, 2014). French scholars, represented by Hélène Jannière, asserted that the urban landscape, from architectural, geological, and botanical viewpoints, embodies a "perceived entity" at the

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



aesthetic level, synthesising views of all city elements (Sonkoly, 2017). This perception encompasses not only visual elements but also engages multiple other senses. Urban aesthetic theory posits that diverse spatial experiences are the foundation of aesthetic experience (Williams, 1954). Individuals are unable to perceive the entirety or comprehend all the intricacies of the urban scene. Information is acquired as fragmented perceptions from various perspectives, and through the processing of individual traits (such as personality, experience, and memory), individuals construct a comprehensive perception in their minds (Tieskens et al., 2018), resulting in the corresponding aesthetic experience.

Schema Theory

Schema Theory, also known as Schema-Based Theory, describes "schema" as the fundamental unit of information organisation inside cognitive processes. Schema Theory asserts that individuals comprehend and interpret their environment through cognitive schemas (Wang et al., 2019). A schema is a systematic framework of cognitive processes and an organisational structure for perceptual information, representing individuals' structured cognition centred on cognitive objects (Shao and Gao, 2009). According to Schema Theory, when individuals perceive aesthetics, they initially consolidate fragmented information into various cognitive schemas and subsequently link these schemas to their pre-existing knowledge and experiences. Upon evaluating the current schemas, they categorise them via assimilation or develop new schemas through accommodation.

The cognitive schema serves as an abstract mechanism within the profound cognitive framework of aesthetic pursuits. Building on this, American researcher Edward Tolman established the notion of Cognitive Mapping in 1948. The cognitive map embodies cognitive schemas, illustrating the perceptual dimensions formed by the cognitive subject in connection to the external environment. The conceptual cognitive map consists of conceptual terms (variables), connecting lines, and labels. It functions as an abstract depiction of the cognitive hierarchy and structural relationships pertaining to a particular situation. An exemplary instance is the story structure map created by American artist Mark Lombardi (Lucarelli, 2012). The spatial cognitive map resembles a physical map but prioritises key perceptual focal points, excluding numerous additional elements. Kevin Lynch employed this

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



form of cognitive map in his urban image studies (Wallace, 2010).

2.3 Approaches in achieving characterization of urban aesthetic

The aesthetic concept is not novel in urban design and planning. Conventional urban design theories concentrate exclusively on the material aspects of the constructed environment. Recognising this, planners have devised additional theories to broaden planning beyond sheer physicality. The "Figure-Ground" theory emphasises the significance of open space and the relationship between solids and voids in urban environments, whereas the foundational "Linkage Theory" pertains to urban thoroughfares and streets. "Place Theory" underscores the connections between the social dimensions of space and human activities (Trancik, 1986; Jacobs, 1961). In these approaches, clear representations of urban sustainability are infrequently exhibited. Consequently, contemporary methodologies such as Green Urbanism and New Urbanism elucidate the effects of social dimensions of planning on the constructed environment.

In practice, these planning discrepancies frequently do not manifest. Nonetheless, a series of liveability and sustainability initiatives, tailored to local subtleties rather than simply branding, are more common in urban areas. The specific limits and potential of each city must be comprehensively analysed to accurately represent its own urban systems encompassing environmental, social, and economic dimensions (Newman and Jennings, 2008). Consequently, harmonising these elements necessitates a cohesive decision-making process focused on attaining urban design goals. An iterative process engaging a comprehensive array of stakeholders in collaborative planning and frequently integrating feedback typically yields a promising urban design methodology.

Collaborative planning as proposed method of aesthetic design

The academic discourse on planning, its objectives, and aims strengthens the values ascribed to it. This discourse has resulted in the current "communicative turn" in planning theory (Healey, 1997). “Communicative Planning Theory” is fundamentally a theory concerning the practice of planning, elucidating and characterising the planning profession. Khalee (1998) noted that the theory emphasises the ethical dilemmas inherent in the profession.

This theory is purportedly based on Jürgen Habermas’s theory of communicative action, albeit the degree of this association is uncertain (Naouel et al., 2018). Habermas, a philosopher,

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



asserts that rationality cannot be limited to "instrumental rationality," hence making a rational discourse on "values" possible. Aestheticians have extrapolated from Habermas's theory to elucidate the function of aesthetics, despite aesthetics not being the central focus of his theory. Nonetheless, Habermas underscored that aesthetic and creative experiences profoundly impact contemporary society, enhancing life-worlds. Habermas's aesthetics may provide essential conceptual support for planning, especially in fostering awareness of innovative views that can improve planning applications.

3.0 Methodology

3.1 Study selection procedure

The study's design was to get qualitative data through a multifaceted methodological approach. This methodology is frequently favoured in urban studies as it facilitates an extensive examination of the subjectivity inherent in urban area. This is essential for comprehending urban aesthetics, characterization, and emerging trends in urban design, as it facilitates and capture the subjectivity of an urban space (Kleih et al., 2021). A literature study was conducted from January 2024 to August 2024.

This methodological approach entailed a meticulous process of identifying and selecting pertinent articles, evaluating them against explicitly defined criteria, extracting relevant information, and synthesising related insights to advance the research objectives. For this study, a thorough assessment of pertinent information was performed through an extensive review of selected articles from the Science-Direct, Scopus, and Google Scholar databases, which were synthesised and integrated into the study. Empirical studies from peer-reviewed academic publications were prioritised.

The majorities of the retrieved articles was published in the last three years, underwent stringent peer review, was written in English, and were meticulously evaluated and chosen based on their novelty and relevance. The selection criteria ensured that each article offered insights into at least one of the following areas: the role of aesthetics in shaping emerging trends, digital urbanism, smart cities, building information modelling design tools, and data-driven urban planning, along with In total, one hundred and forty-five (145) pertinent publications were meticulously selected and incorporated into the analysis, effectively integrated into the comprehensive study.

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/

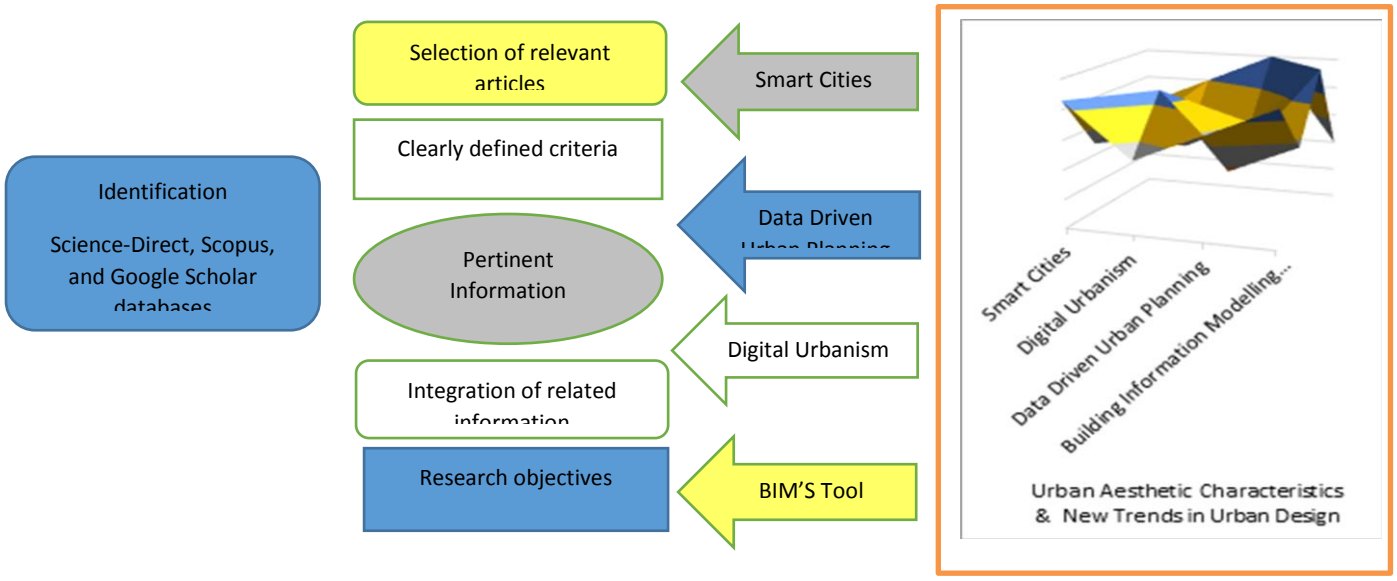


Fig 1. Flowchart of the study based on process of identification, selection of relevant articles, clearly defined criteria, pertinent information extraction, and integration of related information to the research objectives.

2.2 Searching procedures

The literature review was divided into two phases. A comprehensive search was performed for urban aesthetics characterization methodologies in the titles, abstracts, and keywords of pertinent articles within sustainable urbanism research. In the second stage, the "snowball" strategy was utilised, which entailed examining the reference lists of pertinent publications and the latest published papers for associated studies, together with the prior studies they referenced. This strategy was employed to acquire papers that substantially impacted the topic under examination, as the search results from the majority of databases comprised freshly published and highly referenced publications. The primary search terms encompassed "aesthetics, urbanisation, urban planning, urban design, space and built environment, smart cities, digital urbanism, green infrastructure," however they were not exclusively limited to these topics.

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Table 1. *Thematic analysis of papers on Urban Aesthetics Characterization and New Trends in Urban Design (between 2014-2024) of previous research contributions.*

S/N	Year	Authors	Study area focus	Study findings
1	2014	Sadeghi et al., 2014	Environmental Aesthetics, Main Structure, Form of City, Visual-formal factors, Perceptional-meaning factors	Explanation of Environmental Aesthetic Factors of Urban Design
2	2021	Wang, 2021	digital age, urban design, multiple objectives, human-computer interaction, pan-dimensionality, individual ubiquity	Development trend of urban design in "digital age": Pan-dimensionality and individual-ubiquity
3	2021	Stojanovski et al., 2021	City Information Modelling (CIM), urban morphology, urban design, planning, digitalization	City Information Modelling (CIM) - Morphological conceptualizations and digitizing urban design practices
4	2018	Huq et al., 2018	Urban form, Urban Aesthetics, Building façade, Building Elevation	The essence of Urban form and its Relationship with Urban Aesthetics: A case from Rajshahi City, Bangladesh
5	2022	LiWei et al., 2022	digital landscape design, and builds a digital city based on design logic, design basis, environment analysis	An Optimization Model for Landscape Planning and Environmental Design of Smart Cities Based on Big Data Analysis
6	2021	Catalano et al., 2021	Urban ecology, Biodiversity, Holistic design, Design with Nature, Nature-based solution, GeoBIM, DeMo	Smart Sustainable Cities of the New Millennium: Towards Design for Nature
7	2023	Arshi and Mondal, 2023	Smart city, Sensors, Actuators, Sensor technology, Actuator technology, Big data sharing	Advancements in sensors and actuators technologies for smart cities: a comprehensive
8	2024	Liu et al., 2024	smart city; building information modeling (BIM); life cycle; sustainability; business model; innovation; urban management; sustainable development goals (SDGs)	Integration of Smart Cities and Building Information Modeling (BIM) for a Sustainability Oriented Business Model to Address Sustainable Development Goals
9	2021	Gao and Liu, 2021	urban landscape; aesthetic perception; cognitive schema; qualitative analysis	Exploration and Analysis of the Aesthetic Cognitive Schema of Contemporary Western Urban Landscapes
10	2021	Nia, 2021	Urban vitality; urban aesthetics; liveability; functionality of urban spaces	The role of urban aesthetics on enhancing vitality of urban spaces
11	2023	Raza et al., 2023	BIM, Project management, Knowledge areas, Construction industry, BIM adoption	Potential features of building information modeling (BIM) for application of project management knowledge areas in the construction

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



				industry
12	2022	Nikologianni et al., 2022	BIM in the built environment, BIM impact, micro scale, macro scale, landscape design	Building Information Modelling (BIM) and the impact on landscape: A systematic review of evolvements, shortfalls and future opportunities
13	2024	Wei et al., 2024	smart city development; urban industrial heritage; traditional industrial blocks; revitalization; sustainability; community engagement	Exploring the Contribution of Advanced Systems in Smart City Development for the Regeneration of Urban Industrial Heritage
14	2024	Castañeda et al., 2024	Building Information Modeling , Technologies, micro scale, macro scale	Building Information Modeling Uses and Complementary Technologies in Road Projects: A Systematic Review
15	2021	Zhao et al., 2021	smart city development; urban communities, revitalization; sustainability	Smart city research: a holistic and state-of-the-art literature review

Sources: Authors diverse sources

4.0. Results and Discussion

4.1 Smart cities as respond to green infrastructure and urban planning modes

This investigation has revealed the separation of smart cities and the delineation of urban aesthetics. This paper examines emerging trends in urban design and the role of BIM and data-driven cities in urban development. The findings indicate that the smart city represents an urban development paradigm grounded in information and communications technology (ICT), with the objective of improving urban sustainability, efficiency, and the quality of life for residents (Kim and Yang, 2021). This model improves intelligence and sustainability by integrating stakeholders, thereby optimising the governance of interactions between services and infrastructure technologies (Azevedo et al., 2018). The notion of "smart cities" has become increasingly prevalent as urban areas globally seek to enhance the quality of life for their inhabitants through the use of technology and information (Arshi and Mondal, 2023).

This novel methodology employs advanced technology and techniques to enhance multiple facets of urban life, such as transportation, energy consumption, healthcare, and trash management (Arshi and Mondal, 2023). The collaboration of various governmental entities, enterprises, and communities is crucial for the advancement of smart cities, fostering synergies that improve the utilisation of smart city services for enduring sustainability (Kwak and

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Lee, 2021). Pertinent research commenced in 2013, primarily employing case studies (Kim and Yang, 2021; Khelladi et al., 2020), literature reviews (Giourka et al., 2019; Corrales-Garay et al., 2022), and taxonomies (Shetty et al., 2019) as methodological approaches. These research pertained to smart cities from the viewpoints of various stakeholders (Massey et al., 2012). The smart city paradigm integrates innovative, interdisciplinary concepts and commercial approaches that enhance functionality while reducing environmental effects.

The development of smart cities has become a pivotal urban strategy for promoting green growth and improving urban sustainability in the face of climate change (Liu et al., 2024). From a governance standpoint, the advancement of smart cities relies on the interactions among urban stakeholders, which are prioritised over other urban concepts (Schiavone et al., 2019). The notion of smart cities and their commitment to sustainable development (SD) has attracted considerable academic interest. A multitude of academics have investigated several facets of smart city design, technological integration, and its ramifications for urban governance and sustainability (Xia et al., 2022; Yang, 2020). Xia et al. (2022) examined the amalgamation of geographic information systems (GIS) and building information modelling (BIM) within city digital twin technologies, highlighting the potential benefits for sustainable smart city design. Various definitions of smart cities exist (Albino et al., 2015; Toli and Murtagh, 2020), yet there is consensus on six defining dimensions: (1) smart economy (industry and competitiveness), (2) smart mobility (transport and ICT), (3) smart environment (natural resources).

A sustainable city must equilibrate social equity, economic development, and environmental protection (Ahvenniemi et al., 2017). Although the notions of smartness and sustainability may seem analogous, smart assessments frequently omit environmental indicators and prioritise ICT efficiency over ecological impact, whereas sustainable assessments emphasise environmental and social sustainability indicators, often at the detriment of economic considerations (Ahvenniemi et al., 2017). To address the divergence between intelligent and sustainable methodologies, the phrase "sustainable smart city" was coined in the past decade (Bibri and Krogstie, 2017), characterising a city (Hojer and Wangel, 2015). The intelligent sustainable city confronts the challenge of adopting a comprehensive approach aligned with the Sustainable

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Development Goals (SDGs), yet it remains in the nascent phases of conceptualisation and execution (Kutty et al., 2020).

Each of the six dimensions of a smart city can be evaluated (smart city ranking) through specific factors and indicators (Albino et al., 2015; Lopez-Chao et al., 2020). The indicators suggested by Lombardi et al. (2012) are associated with the six dimensions of smart cities within an adapted triple helix model, which is essential for the knowledge creation and capitalisation process involving universities, industry, government, and civil society. Within this framework, certain issues can be examined through the analysis of land use datasets (Uchiyama and Kohsaka, 2017), including publicly accessible global land use datasets (Tateishi et al., 2014). The amalgamation of the smart city paradigm, data-driven urban planning, and Building Information Modelling (BIM) is seen as an efficacious strategy for mitigating emissions, safeguarding the environment, and reducing expenses, hence benefiting the market and industry (Ensslen et al., 2020).

4.2 Data driven urban planning as new trends in urban design

According to the preceding section and subsequent study, it can be asserted that the efficient management, processing, and utilisation of varied data sets are crucial for tackling these difficulties and other project dimensions (Aziz et al., 2017). Consequently, the use of data for urban space study and research has emerged as the predominant focus of contemporary urban studies (Carter et al., 2020). Data has emerged as a novel medium for urban design expression and inquiry. In contrast to the conventional graphical urban design language, the data language is more empirical and objective. Urban design must be executed within the three-dimensional context of the city, necessitating the presentation of data analysis and research findings through diverse spatial diagrams to enhance the intuitiveness and efficacy of planning policies (Bibri, 2021). Big data research serves as a cross-disciplinary methodology or knowledge discovery instrument, intricately linked to artificial intelligence techniques such as data mining and statistical analysis, yet distinct from the fundamental implications of statistics and AI (Kim, 2019). The advent of extensive data storage and computing technology has propelled humanity into a new epoch. The

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



notion of big data is gaining prominence (Radu, 2020), and the swift advancement of digitalisation has introduced numerous obstacles to urban development.

Consequently, contemporary urban development necessitates vitality and innovation, aligning with current trends, incorporating science and technology into research, and formulating an effective approach for intelligent garden design (Deng et al., 2021). The digital intelligence integrated into every phase of urban landscape planning and design enhances the scientific rigour, precision, and intelligence of urban landscape planning (Xu and Geng, 2019). It offers a theoretical framework for tackling challenges associated with land use, natural surroundings, and hydrological systems in urban contexts, facilitating the development of digital cities. The digital landscape can be classified as digital urban green spaces, habitat information acquisition and planning, digital landscape system analysis and evaluation, and digital simulation. Numerous studies have investigated data-driven urban planning as an emerging trend in urban design. Qi et al. (2020) examined the correlation among work, domicile, and commuting in Beijing utilising LBS transit card data collected over a seven-day period. Adiguzel et al. (2020) performed an urban big data analysis employing spatial functional applications derived from microblogging platform data. Simultaneously, Zhang (2018) utilised microblog check-in big data to examine the attributes of regional crowd activities within the Yangtze River Delta.

In this context, acknowledging the integration of heterogeneous data from diverse sources and the necessity for data provision in urban planning, the design of smart city system architecture should significantly contribute to the implementation and advancement of smart cities (Shin, 2018). However, the obstacles associated with big data sharing encompass security concerns (Roberson et al., 2022), interoperability issues, and the volume and velocity of data. Data management issues include attribution and accountability, data quality and verification, and regulatory compliance. Potential solutions for data sharing encompass the use of block-chain for safe data exchange, standardisation of protocols, data verification through machine learning, and the application of ethical AI methodologies (Roberson et al., 2022).

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



4.3 Digital urbanism as role of aesthetics in generating emerging trends

According to the preceding section and subsequent analysis, it can be asserted that the "digital era," characterised by digital information, is imminent, and that the Internet, big data, AI, IoT, and smart cities are significantly altering societal development trajectories and evolutionary pathways, as well as human production methods, social interactions, and lifestyles (Balogun et al., 2020; Teubner and Stockhinger, 2020). Digital technology can mitigate uncertainty for individuals and the environment, enhancing confidence, security, and expectation in a chaotic world (Wang, 2021). A society characterised by big data, pervasive computing, and the Internet of Everything will demonstrate significant traits of ubiquity, intelligence, universality, and precision (Dufva and Dufva, 2019). Digital ubiquity facilitates the emergence of smart cities by prompting changes in architecture, planning, and urban design (Duarte and Ratti, 2021).

Urban designers must produce compelling visual representations of cities, master plans, or design standards. Consequently, when confronted with a selection among Geographic Information Systems (GIS), Computer-Aided Design (CAD), Building Information Modelling (BIM), or 3D modelling software, urban designers frequently illustrate and annotate printed two-dimensional cadastral maps obtained from GIS (Stojanovski et al., 2021). The creation and augmentation of urban dynamism necessitate the "coexistence of explicit and implicit vitality" (Wang, 2021). The "invisible vitality" of urban dynamics is significantly altering the principles of spatial positioning within the metropolis (Wang, 2018). Urban design traditionally emphasized the functionality, layout, spatial organisation, and operational maintenance of physical environments, characterised as "three-dimensional material entity + time dimension + static or sequential scene." It is imperative for urban design to evaluate urban spatial objects utilising engineering principles and technical methodologies (Louail et al., 2014; Yang et al., 2020), encompassing visual aesthetics, spatial experience, and place perception, necessitating expertise in visual perceptual science, environmental behaviour, and ergonomics.

Conversely, digitalisation entails the conversion of intricate and variable information into quantifiable data, which is subsequently employed to create suitable digital models, transformed into binary code, and processed by computers this constitutes the fundamental

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



process of digitization (Roth, 2019; Doukari and Greenwood, 2020). Digitalisation emphasizes outcomes and systematically organises digitised information, so enhancing inquiry retrieval, intelligent analysis, and solutions for pertinent decision-making challenges (Wang, 2021).

Although, through the collection, analysis, and integration of diverse social energy flows (both structured and unstructured) (Abdul-Rahman et al., 2020), in conjunction with individual-driven social behaviour big data, preference choice big data, and traffic information big data, one can identify the correlations between urban social demographics and alterations in urban functional configuration (Kousiouris et al., 2018; Gong et al., 2020). This provides a significant scientific foundation for contemporary large-scale urban design. The data encompasses spatial dimensions, formatting, activities, historical context, landscape characteristics, and energy usage (Kong et al., 2020). However, the primary tasks encompass data mining, data analysis, and model development. Interdisciplinary expert collaboration has emerged as a crucial driver for urban design. Historically, professional design plans and drawings were predominantly available to pertinent professionals. Significantly, contemporary design outcomes can be communicated to the public in a more efficient, intuitive (visual), succinct, and comprehensible manner (Sanchez-Sepulveda et al., 2019). The city is acknowledged as a multifaceted system and a cognitive "black box." Urban design constitutes a knowledge system pertaining to the creation and modification of material spatial forms, amalgamating humanities, art, technology, and materials (Abd-Elrahman and Asaad, 2021).

4.4 Building information modelling (BMI) as design tool in built environment

The analysis from the systematic literature review and the examination of the relationship between BIM and various dimensions (digital urbanism, data-driven cities, and smart cities) identified the dimensions of 'landscape planning,' 'building methods,' and 'residential areas' for the planning area. In the realm of urban design, the identified aspects are 'infrastructure' and 'landscape design.' Consequently, from a BIM perspective, it can be asserted that planning functions as the primary conduit via which BIM data and visualisations can influence construction methodologies and facilitate landscape planning. The integration of BIM and GIS tools can improve infrastructure development (Andrianesi and Dimopoulou,

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



2020; Kuster et al., 2020) by utilising data from landscape planning and construction techniques. The concept of BIM originated in the 1970s, whereas the term 'building model' (as currently defined) first appeared in scientific literature in the mid-1980s.

The phrase "creating data model" was initially presented in the publication of Van Nederveen and Tolman (1992) (Eastman et al., 2008). BIM is a methodology utilised for the creation and management of digital representations of diverse structural components. BIM models encompass data that can be extracted, modified, and disseminated over collaborative networks to aid construction professionals in decision-making processes (Raza et al., 2023). According to Rokooei (2015), BIM enhances interdisciplinary collaboration, teamwork, and coordination among stakeholders to mitigate disputes. Furthermore, BIM facilitates centralised and organised data management through detailed representations of objects in network design (nD) models (Melzner et al., 2015; Dubas and Paslawski, 2017). A cohesive model and seamless information exchange enhance collaboration and comprehension, thereby streamlining decision-making and mitigating conflicts (Shaqour, 2022; Dubas and Paslawski, 2017).

The implementation of Building Information Modelling (BIM) technology has expanded information modelling from the individual building level to the larger urban scale (Xue et al., 2021). BIM, once seen as a frontier in smart city development, enhances data management and visualisation, hence promoting more effective urban planning and infrastructure development (Valinejadshoubi et al., 2019). BIM represents a digital depiction that includes both the physical attributes and operational features of a structure. It acts as a dependable foundation for information modelling, serving as a collective knowledge repository for facility information throughout its entire life cycle (Pishdad-Bozorgi et al., 2018). Building Information Modelling (BIM) is acknowledged as one of the most established digital technologies that has transformed numerous processes in the built environment. BIM is a collaborative methodology characterised by technological integration that facilitates the centralised exchange, sharing, and updating of project data (Demian and Walters, 2014).

This has facilitated enhanced coordination and collaboration among parties engaged in developing an integrated model (Ghaffarianhoseini et al., 2017; Mayouf-Boyd and Cox, 2014). The implementation of BIM

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



allows for the updating of all information within a shared data environment, accessible to all interested stakeholders (Liu et al., 2009). This enhances all stages of a project lifecycle, particularly information management on construction sites, which often encounters difficulties in handling the exchange of information (such as daily safety reports) produced from multiple sources that may contain redundant information (Lee et al., 2018).

In the realm of landscape design, the contribution and significance of BIM are markedly constrained and challenging to ascertain in comparison to research initiatives centred on BIM's influence. This can be ascribed to various variables, including regional and national landscape variety, challenges in accessing or acquiring databases of places and infrastructures, and related economic implications (Hallgeir et al., 2018). Nonetheless, a lack of interdisciplinary integration persists in this domain focused on promoting sustainable development. Nonetheless, the research conducted by Zandee et al. (2024) and Zanni et al. (2019) collectively indicates that investigations in this domain could offer both theoretical and practical insights for the sustainable transformation of society, thereby positively impacting the achievement of the UN Sustainable Development Goals.

Currently, the city information model (CIM) related to smart cities embodies a complex integration of urban construction systems and subsystems (Lom and Pribyl, 2021), characterised by "roaming on the cloud, weaving a network under the cloud, connecting lines online, and nodes online" (Wang, 2021). Through the interplay of “points, lines, networks, and clouds,” the cross-validation of data from diverse systems, and the application of iterative algorithms to derive value domain optimisation intervals with minimum thresholds (Wang, 2021), a novel paradigm for urban research and engineering emerges, characterised by increased complexity and alignment with the multifaceted objectives of “instrumental rationality” and “value rationality.”

Hence, this innovative methodology is informed by probabilistic “gray scale thinking” (Wang, 2021). The resultant urban design can embody the quadratic synergistic perspective of “scientific rationality, ecological rationality, cultural rationality, and technical rationality” to achieve the cognitive advancement of “engineering for the benefit of mankind”

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



(Wang, 2021). The BIM-oriented functionalities, including intricate data management and simulation (integrated within GeoBIM), would automate or semi-automate essential phases of ecological modelling, encompassing complex data management (local and/or external storage, IoT-based surveys, and satellite imagery) and model parameterisation (Moulherat et al., 2019).

According, Carvalho et al. (2020) examined various BIM systems for green building design and sustainability certifications. Initial research advocates for BIM procedures and methods to address environmental and biodiversity concerns at the landscape level (Moulherat et al., 2019; Jupp, 2017), although there is an absence of data models that facilitate BIM dimensions for geographic and temporal landscape assessment (Flaxman, 2009). The amalgamation of BIM with GIS, referred to as GeoBIM, has advanced (Mignard and Nicolle, 2014) and facilitates sustainable development via precise urban analysis. Utilising geospatial information alongside BIM enables politicians, landscape and urban planners, and real estate owners/investors to make really ecologically responsible decisions throughout the lifecycle, extending beyond mere predictions of energy performance.

5.0 Conclusion

This article has explore the relationship between BIM and several dimensions (digital urbanism, data-driven cities, and smart cities) in landscape design, employing a systematic literature review (SLR) to establish tangible links and future prospects in urban aesthetics. The findings of this study indicate that only particular associations between BIM and landscape have been established thus far, as demonstrated by an emphasis on three primary domains within landscape: planning, urban design, and smart cities. The study emphasises the insufficient interaction between BIM and the landscape, hence neglecting a chance for this digital tool to assist landscape experts.

Employing qualitative grounded theory as the principal methodological instrument and executing a systematic review of pertinent literature for qualitative data acquisition, five fundamental dimensions of urban vitality were conceptualised, essential for correlating with the aesthetic quality of urban design. The research suggests that the visual design of an urban environment significantly influences user engagement, which subsequently impacts the degree of public urban vitality. The integration of complexity theory with the five primary characteristics for evaluating urban vitality is

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



proposed as a promising avenue for further investigation. Research findings indicate that, while elucidating the differences between BIM and examining the rate of technological progress concerning urban aesthetics and open spaces, it is clear that most scholarly endeavours have concentrated on planning rather than urban design and smart cities.

Nonetheless, recent advancements have sparked increased interest in urban design problems; yet, these studies lack substantial proof of a wider interest concerning BIM and landscape, warranting further exploration. The research indicated that the aesthetic uniformity generated in urban planning is generally non-confrontational and widely acceptable. Current research indicates that a multidimensional and integrated approach, incorporating urban planning, BIM design tools, and digital urbanism, provides both theoretical and practical guidance for attaining sustainable development. This will be particularly beneficial for municipal administrators who oversee, review, and assess urban sustainability while identifying potential for economic, social, and environmental changes.

References

Abd Elrahman, A. S., & Asaad, M. (2021). Urban design & urban planning: Acritical analysis to the theoretical relationship gap. *Ain Shams Engineering Journal*, 2021, 12(1): 1163–1173

Abdul-Rahman, M., Chan, E. H. W., Wong, M. S., Irekponor, V. E., & Abdul-Rahman, M .O. (2020). A framework to simplify pre-processing location based social media big data for sustainable urban planning and management. Cities (London, England), 2020, 109: 102986

Adiguzel, F., Cetin, M., Kaya, E., & Simsek, M. (2020). Defining suitable areas for bioclimatic comfort for landscape planning and landscape management in Hatay, Turkey," theoretical and Applied Climatology, vol. 139, no. 3, pp. 1493–1503, 2020.

Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities*, 60:234–245. https://doi.org/10.1016/j.cities.2016.09.009

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: definitions, dimensions, performance, and initiatives. *J Urban Technol*, 22:3–21. https://doi.org/10.1080/10630732.2014.942092

Amen, M. A., & Kuzovic, D. (2018). The effect of the binary space and social interaction in creating an actual context of understanding the traditional urban space. *Journal of Contemporary Urban Affairs*, 2(2), 71–77. https://doi.org/10.25034/ijcua.2018.3672

Amen, M. A., & Nia, H. A. (2021). The Effect of Cognitive Semiotics on the Interpretation of Urban Space Configuration. https://doi.org/doi:10.38027/iccaua2021227n9

Andrianesi, D. E., & Dimopoulou, E. (2020). An integrated BIM-GIS platform for representing and visualising 3D cadastral data. ISPRS Annals of the Photogrammetry, *Remote Sensing and Spatial Information Sciences*, 4 (4/W1), 3–11.

Arshi, O., & Mondal, S. (2023). Advancements in sensors and actuators technologies for smart cities: a comprehensive review. *Smart Construction and Sustainable Cities*, (2023) 1:18 Page 18 of 19https://doi.org/10.1007/s44268-023-00022-2

Azevedo Guedes, A. L., Carvalho Alvarenga, J., Dos Santos Sgarbi Goulart, M., Rodriguez y Rodriguez, M.V., & Pereira Soares, C. A. (2018). Smart cities: The main drivers for increasing the intelligence of cities. *Sustainability*, 2018, 10, 3121.

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Aziz Amen, M. (2017). The inspiration of Bauhaus principles on the modern housing in Cyprus. *Journal of Contemporary Urban Affairs*, 1(2), 21–32. https://doi.org/10.25034/ijcua.2017.3645

Aziz Amen, M., & Nia, H. A. (2018). The dichotomy of society and urban space configuration in producing the semiotic structure of the modernism urban fabric. *Semiotica*, 2018 (222), 203–223. https://doi.org/10.1515/sem-2016-0141

Aziz, Z., Riaz, Z., & Arslan, M. (2017). Leveraging BIM and Big Data to Deliver Well Maintained Highways. Facilities 2017, 35, 818–832.

Bahrainy, H., & Khosravi, H. (2013). The impact of urban design features and qualities on walkability and health in under-construction environments: the case of Hashtgerd New Town in Iran. Cities 31, 17–28.

Balogun, A. L., Marks, D., Sharma, R., Shekhar, H., Balmes, C., Maheng, D., Arshad, A., & Salehi P. (2020). Assessing the potentials of digitalization as a tool for climate change adaptation and sustainable development in urban centres. *Sustainable Cities and Society*, 2020, 53: 101888

Bayer, R., & Reuter, J. (1961/2014). Historia de la estética. FCE - Fondo de Cultura Económica, 25pp

Bell, P. A., Greene, T. C., Fisher, J. D., & Baum, A. (2001). Environmental Psychology (5th ed.). New York: Harcourt.

Bibri, S. E., & Krogstie, J. (2017). Smart sustainable cities of the future: an extensive interdisciplinary literature review. *Sustain Cities Soc*, 31:183–212. https://doi.org/10.1016/j.scs.2017.02.016

Bibri, S. E. (2021). A novel model for data-driven smart sustainable cities of the future: the institutional transformations required for balancing and advancing the three goals of sustainability," *Energy Informatics*, vol. 4, no. 1, pp. 1–37, 2021.

Boeing, G. (2018). Measuring the Complexity of Urban Form and Design", Urban Design International, Vol. 23 No. 4 (October).

Brielmann, A. A., Buras, N. H., Salingaros, N. A., & Taylor, R. P. (2022). What Happens in Your Brain When You Walk Down the Street? Implications of Architectural Proportions, Biophilia, and Fractal Geometry for Urban Science. *Urban Science*, 6(1), 3.

Calvo Fernández, C. (2018). La muerte de la belleza y su reformulación contemporánea: Leigh Bowery y el Body Art. Fedro. Revista de Estética y Teoría de las Artes, 18, 63-79.

Campos Bueno, J. J. (2010). Neuroestética: hacia un estudio científico de la belleza y de los sentimientos estéticos compartidos en el arte. 25pp

Carter, E., Adam, P., Tsakis, D., Shaw, S., Watson, R., & Ryan, P. (2020). Enhancing pedestrian mobility in smart cities using big data," *Journal of Management Analytics*, vol. 7, no. 2, pp. 173–188, 2020.

Carvalho, J. P., Bragança, L., & Mateus, R. (2020). A Systematic review of the role of BIM in building sustainability assessment methods. Appl Sci 10:4444. https://doi.org/10.3390/app10134444

Castañeda, K., Sánchez, O., Herrera, R. F., Gómez-Cabrera, A., & Mejía, G. (2024). Building Information Modeling Uses and Complementary Technologies in Road Projects: A Systematic Review. Buildings 2024, 14, 563. https://doi.org/10.3390/buildings14030563

Corrales-Garay, D., Ortiz-de-Urbina-Criado, M., & Mora-Valentín, E. M. (2022). Understanding open data business models from innovation and knowledge management perspectives. *Bus. Process Manag. J.* 2022, 28, 532–554.

Demian, P., & Walters, D. (2014). The advantages of information management through building information modelling. *Construction Management and Economics*, 32 (12), 1153–1165. https://doi.org/10.1080/01446193.2013.777754.

Deng, T., K. Zhang, & Shen, Z. J. (2021). A systematic review of a digital twin city: a new pattern of urban governance toward smart cities," *Journal of Management Science and Engineering*, vol. 6, no. 2, pp. 125–134, 2021.

Doukari, O., & Greenwood, D. (2020). Automatic generation of building information models from digitized plans. *Automation in Construction*, 2020, 113: 103129

Duarte, J. P., Beirão, J. N., Montenegro, N. & Gil, J. (2012). City Induction: a model for formulating, generating, and evaluating urban designs. In Arisona, S. M., Aschwanden, G., Halatsch, J., and Wonka, P. (eds.) Digital Urban Modeling and Simulation. Springer, *Berlin, Heidelberg*, 73-98pp.

Dubas, S., & Paslawski, J. (2017). The concept of improving communication in BIM during transfer to operation phase on the Polish market, *Procedia Eng*. 208 (2017)14–19, https://doi.org/10.1016/j.proeng.2017.11.015.

Dufva, T., & Dufva M. (2019). Grasping the future of the digital society. *Futures*, 2019, 107: 17–28

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2008). BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, designers, engineers and contractors, 2008. 20pp

Ensslen, A., Gnann, T., Jochem, P., Plötz, P., Dütschke, E., & Fichtner, W. (2020). Can product service systems support electric vehicleadoption? Transp. Res. Part A: Policy Pract. 2020, 137, 343–359.

Fariña Tojo, J. (2015). Modelo urbano contemporáneo: una nueva definición de la dinámica urbana, 1-12pp

Flaxman, M. (2009). Fundamentals of Geodesign. Peer Reviewed Proceedings of Digital Landscape Architecture 2010 at Anhalt, *University of Applied Sciences*. 22pp

Gong, V. X., Daamen, W., Bozzon, A., & Hoogendoorn, S. P. (2020). Crowd characterization for crowd management using social media data in city events. *Travel Behaviour & Society*, 2020, 20: 192–212

Hallgeir, W. K., Marius, S., Amund, E. B., & Jostein, T., (2018). BIM for landscape: a Norwegian standardization project. *Journal of Digital Landscape Architecture,* 3pp.

Hassan, A. M., & Lee, H. (2015). The paradox of the sustainable city: definitions and examples. *Environ Dev Sustain* 17:1267–1285. https://doi.org/10.1007/s10668-014-9604-z

Healey, P. (1997). Collaborative Planning. Shaping Places in Fragmented Societies. Basingstoke: McMillan.

Hidalgo, C. (2008). Paisajes urbanos: Ciudades habitables. En Fernández-Ramírez, B.; Vidal i Moranta, T.; Castrechini Trotta, Á. (2008). Psicología de la ciudad: debate sobre el espacio urbano. Editorial UOC

Jacobs, A., & Appleyard, D. (1987). Toward an Urban Design Manifesto. *Journal of the American Planning Association*, 53(1), 112-120. doi:10.1080/01944368708976642

Jacobs, J. (1961). The Death and Life of Great American Cities, Random House Inc, New York.25pp

Jiménez, V., Hidalgo, R., Campesino, A. J., & Alvarado, V. (2018). Normalización del modelo neoliberal de expansión residencial más allá del límite urbano en Chile y España. *EURE (Santiago)*, 44(132), 27-46.

Jupp, J. (2017). 4D BIM for environmental planning and management. *Procedia Eng* 180:190–201. https://doi.org/10.1016/j.proeng.2017.04.178

Khelladi, I., Castellano, S., & Kalisz, D. (2020). The smartization of metropolitan cities: The case of Paris. *Int. Entrep. Manag. J.* 2020, 16, 1301–1325.

Kim, J., & Yang, B. A. (2021). Smart city service business model: Focusing on transportation services. *Sustainability* 2021, 13, 10832.

Kim, K. G. (2019). Development of an integrated smart water grid model as a portfolio of climate smart cities," *Journal of Smart Cities*, vol. 3, no. 1, pp. 23–34, 2019.

Kleih, A. K., Lehberger, M., & Sparke, K. (2021). Using Photographs in Mixed Methods Research: An Illustration Integrating Quantitative and Qualitative Analyses from Consumer Research. *Journal of Mixed Methods Research*, 15586898211056748.

Kong, L., Liu, Z., & Wu, J. (2020). A systematic review of big data-based urban sustainability research: State-of-the-science and future directions. *Journal of Cleaner Production*, 2020, 273: 123142

Koolhaas, R., (2006). La ciudad genérica. 30pp

Naouel, H. B., Foued, B., & Abdelouhab, B. (2018). Urban Strategies for a Renewal of Algerian Cities: Constantine of Tomorrow. *Civil Engineering and Architecture*, 6(1), 18 - 24.DOI:10.13189/cea.2018.060102.

Newman, P., & Jennings, I. (2008). Cities as Sustainable Ecosystems: Principles and Practices. Island Press, Washington, DC.

Ratcliffe, J., Stubbs, M & Shepherd, M. (2004). Urban Planning and Real Estate Development. Second Edition. Spon Press.

Shao, Z., & Gao, X. (2009). Social Cognition; Shanghai People's Publishing House: Shanghai, China, 2009.

Shaqour, E. N. (2022). The role of implementing BIM applications in enhancing project management knowledge areas in Egypt, Ain Shams Eng. J. 13 (2022), https://doi.org/10.1016/j.asej.2021.05.023

Stojanovski, T., Zhang, H., Peters, C., Parthanen, J., Sanders, P., & Ivor Samuels, I. (2021). City Information Modelling (CIM) - Morphological conceptualizations and digitizing urban design practices. XXVIII International Seminar on Urban Form ISUF2021: Urban Form and the Sustainable and Prosperous Cities 29th June – 3rd July 2021, Glasgow. Pp1-14

Teubner, R. A., & Stockhinger, J. (2020). Literature review: Understanding information systems strategy in the digital age. *Journal of Strategic Information Systems*, 2020, 29(4): 101642

JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Van Nederveen, G. A., & Tolman, F. P. (1992). Modelling multiple views on buildings, Autom. *ConStruct.* 1 (1992) 215–224, https://doi.org/10.1016/0926-5805(92)90014-B.

Vaughan, T. (1987). Common ground: Towards an architecture of continuity. *Journal of Architectural Education,* 40(2),82–84.

Wallace, T. (2010). Kevin Lynch and the Imageable Boston [EB/OL]. Available online: https://bostonography.com/2010/kevin-lynchthe-imageable-boston/ (accessed on 12 December 2010).

Wang J. (2021).Vision of China's future urban construction reform: In the perspective of comprehensive prevention and control for multi disasters. *Sustainable Cities and Society*, 2021, 64: 102511

Williams, S. H. (1954). Urban aesthetics: An approach to the study of the aesthetic characteristics of cities. *Town Plan. Rev*. 1954, 25, 95–113.

Wilson, W. H. (1996). The Glory, Destruction, and Meaning of the City Beautiful Movement, in S. Campbell and S. Fainstein (eds) Readings in Planning Theory, pp. 68-103. Oxford: Blackwell.

Xu, H., and Geng, X. (2019). People-centric service intelligence for smart cities," *Smart Cities*, vol. 2, no. 2, pp. 135–152, 2019.

Xue, F., Wu, L., & Lu, W. (2021). Semantic enrichment of building and city information models: A ten-year review. Adv. Eng. Inform. 2021, 47, 101245.

Zhang, L. (2018). LA PKU'S research on China'S traditional eco-wisdom and related application IN contemporary landscape planning and design," *Landscape Architecture Frontiers*, vol. 6, no. 3, pp. 12–28, 2018.