

Original article

Modern Architecture and the Evolution of Form, Space, and Society

Feeras Shawesh 

Architecture and Planning Departments, Faculty of Engineering Technology, Aljafara University, Aljafara, Libya
Corresponding Email. Feeras.shawesh@gmail.com

Abstract

This study explores how modern architecture developed from the late 19th to the mid-20th century, focusing on the forces that reshaped how buildings were designed and experienced. It examines how new technologies, social change, and artistic movements together transformed architectural form and purpose. Through case studies and comparisons, the paper highlights major movements such as Bauhaus, De Stijl, and Soviet Constructivism, as well as adaptations in regions like the United States, Japan, and Egypt. By combining theory, history, and visual analysis, the research shows how modernism created a new architectural language, one based on function, material honesty, and social ideals. It also discusses how these ideas continue to influence contemporary design, education, and urban development.

Keywords. Modern Architecture, Modernism, Design Innovation, Social Reform, Global Adaptation.

Introduction

Modern architecture emerged during a period of intense industrial, social, and artistic transformation. The 19th century's technological revolutions, marked by advances in steel, iron, glass, and reinforced concrete, enabled architects to transcend traditional structural limitations. At the same time, shifting social orders, population growth, and urbanization created a demand for new forms of housing, civic buildings, and infrastructure that could address the needs of a modernizing world.

Philosophically, modern architecture arose as a rejection of historical imitation. Architects sought a design language that was sincere to its materials and expressive of its time. The principle of 'form follows function,' popularized by Louis Sullivan, reflected the desire to unify purpose and design without recourse to unnecessary ornamentation. This ethos would influence the rise of the International Style and the rationalization of building processes. Parallel to material and functional innovations were artistic movements such as Art Nouveau, Cubism, and later De Stijl and Constructivism, which questioned spatial norms and championed abstraction. These movements contributed to a broader cultural rethinking of architecture as not merely shelter, but as an expressive, social, and technological medium. In this context, figures like Frank Lloyd Wright, Walter Gropius, Le Corbusier, and Mies van der Rohe played pivotal roles in shaping modernism's trajectory. Their contributions laid the groundwork for modern architecture's international dissemination and its influence on 20th-century urbanism, design education, and architectural discourse. As architectural theorists like Curtis (Collins, 2004) and Frampton (Curtis, 1996) noted, this period marked a critical turning point in redefining the relationship between form, material, and function. Their works provide comprehensive frameworks for understanding the shift from decorative historicism to functional abstraction.

Methods

While modern architecture developed prominently in Europe and the United States, non-Western regions also engaged with and adapted modernist principles. Japanese architect Kenzo Tange merged traditional Japanese spatial concepts with modernist ideals in works like the Hiroshima Peace Memorial Museum (1955). In Egypt, Hassan Fathy combined vernacular materials with modern social housing strategies in New Gournah. These examples highlight how modernism's core tenets, material honesty, functional clarity, and social purpose, were reinterpreted within distinct cultural and environmental contexts. Such global adaptations reveal the flexibility and ideological reach of modernist architecture. This study adopts a historical-analytical methodology, drawing upon primary architectural texts, critical theory, and comparative case studies. It integrates visual and textual analysis to examine how technological, artistic, and ideological developments shaped modern architecture across different regions. The research also considers theoretical perspectives from architectural historians and cultural theorists to contextualize architectural transformation within broader societal shifts.

Methodological Framework

The study employs a historical analytical methodology, a well-established approach in architectural historiography. This framework allows the researcher to trace the evolution of modern architecture by examining its social, technological, and cultural foundations through:

Historical Inquiry

Investigating architectural developments from the late 19th to mid-20th centuries in relation to industrialization, modern art movements, and social reform.

Comparative Analysis

Juxtaposing architectural movements (e.g., Bauhaus, De Stijl, Soviet Constructivism, and early American modernism) to identify shared principles such as material honesty, functionality, and abstraction—and how these were differently expressed across contexts.

Visual and Material Analysis

Assessing representative buildings and drawings (e.g., Crystal Palace, Bauhaus Dessau, Robie House, unite d'Habitation) to illustrate how form, space, and technology interact. Figures and comparative charts (Figures 1–4) visualize shifts in material usage and spatial logic across regions and movements.

Sociocultural Contextualization

Framing architecture not merely as an artistic discipline but as a social instrument addressing industrialization, housing reform, and postwar reconstruction, connecting design choices to human needs and political ideologies. This mixed historical comparative strategy ensures both chronological depth and cross-regional breadth, bridging European, American, and non-Western modernist narratives.

Case studies and examples were chosen according to four key criteria

Representativeness of Ideological Paradigms

Cases embodying central tenets of modernism: functionalism, material truth, and abstraction. Example: Bauhaus Building (Gropius, 1926) represents a synthesis of art and industry.

Technological and Material Innovation

Buildings that introduced or exploited new construction materials and techniques iron, steel, reinforced concrete, and curtain walls. Example: Crystal Palace (Paxton, 1851) and Home Insurance Building (Jenney, 1885) as technological breakthroughs.

Cultural and Geographic Diversity

Selection across continents to demonstrate the global adaptation of modernist ideals. European (Bauhaus, De Stijl), American (Wright, Sullivan, Neutra), Soviet (Constructivism), and non-Western (Tange, Fathy) examples illustrate cultural translation of the movement.

Influence and Legacy

Projects with enduring pedagogical or urban impact, influencing subsequent design education, housing policy, and urban morphology. Example: Unité d'Habitation (Le Corbusier) and Siedlungen Frankfurt (Ernst May)

Industrialization and Architectural Innovation

The 19th century ushered in an era of unprecedented industrial growth that fundamentally reshaped architecture [1]. New materials, such as iron, steel, and reinforced concrete, enabled engineers and architects to realize structures that had been inconceivable under traditional masonry systems [2]. Industrialization not only introduced new building technologies but also demanded new building types, such as train stations, warehouses, department stores, and factories. Joseph Paxton's Crystal Palace (1851) is one of the earliest and most iconic examples of modern industrial design [3]. Built with prefabricated cast iron and glass components, the structure could be assembled rapidly and economically [4]. Its transparent surfaces and vast interior span reflected both the technical and symbolic ambitions of industrial modernity. The Crystal Palace demonstrated that buildings could now be treated as modular machines, designed for efficiency, scale, and repetition.

Gustave Eiffel's tower (1889) in Paris further illustrated the expressive and structural possibilities of exposed iron. Originally controversial for its aesthetic divergence from stone classical monuments, the Eiffel Tower came to represent industrial strength and national pride. Other key examples, such as Henri Labrouste's Bibliothèque Sainte-Geneviève and the later Gare de l'Est train station, also celebrated structure and space, blending utilitarian purpose with elegant expression. In the United States, industrialization facilitated the rise of the skyscraper. Cities like Chicago and New York developed innovative steel-frame systems that allowed buildings to rise vertically without relying on thick load-bearing walls. William Le Baron Jenney's Home Insurance Building (1885) is often cited as the first true skyscraper, using a steel skeleton to carry structural loads. Architects such as Louis Sullivan further refined the typology, creating visually coherent and functionally logical forms that celebrated verticality and transparency. Concrete was also rediscovered and reengineered during this period. French architect Auguste Perret advanced the use of reinforced concrete, emphasizing its structural and aesthetic potential. His 1903 apartment building at 25 bis Rue Franklin in Paris featured a visible concrete frame, large windows, and a flat roof, an early modernist prototype that influenced generations of architects. Industrialization thus redefined the architect's role, merging art with engineering. It introduced a material logic based on efficiency, production, and structural truth, laying the groundwork for modern architecture's core principles.

Artistic Revolutions: From Ornament to Abstraction

Artistic movements at the turn of the 20th century, most notably Art Nouveau, Cubism, Futurism, and De Stijl, challenged the conventional relationship between structure, ornament, and space [2]. These movements did not merely influence the aesthetic surface of architecture; they radically redefined the conceptual frameworks for spatial organization and visual representation. Art Nouveau, which flourished in cities like Brussels, Paris, and Barcelona, embraced nature-inspired forms, flowing lines, and integrated ornamentation. Architects such as Victor Horta and Hector Guimard embedded ironwork and glass into their designs to create unified, expressive environments. Antoni Gaudí, meanwhile, fused medieval revivalism with biomorphic design in his iconic Casa Batlló and Sagrada Família. While Art Nouveau still relied on ornament, it marked a critical break from historical pastiche and a move toward creative freedom.

Cubism, introduced by artists like Pablo Picasso and Georges Braque, deconstructed objects into fragmented planes and multiple viewpoints. Although primarily a visual art movement, its spatial philosophy influenced architecture profoundly. Le Corbusier absorbed Cubist principles into his early work, especially in his explorations of spatial layering and abstract compositions. He translated Cubism's two-dimensional explorations into three-dimensional architectural forms. The De Stijl movement, founded by Theo van Doesburg and Piet Mondrian, furthered the abstraction agenda. With its reliance on primary colors, rectilinear grids, and spatial purity, De Stijl provided a blueprint for architectural minimalism. Gerrit Rietveld's Schröder House (1924) is a manifest example, integrating modular plans, sliding partitions, and color-coded surfaces. The house became a model for integrating dynamic composition and spatial fluidity.

Futurism, led by Antonio Sant'Elia, embraced speed, technology, and machine aesthetics. Though his designs were mostly theoretical, his vision of a mechanized urban landscape influenced later modernist planning and architecture, particularly in Fascist Italy and Constructivist Russia. Together, these artistic revolutions dismantled the decorative conventions of the 19th century. They laid the intellectual and aesthetic groundwork for architectural modernism, replacing historical reference with abstraction, order, and visual experimentation.

Social Reform and Housing Movements

Post-World War I Europe faced a housing crisis, prompting governments and architects to innovate. Ernst May's Siedlungen in Frankfurt between 1925 and 1930 offered mass housing with modern kitchens, modular plans, and green public space. The Frankfurt Kitchen by Grete Schütte-Lihotzky optimized domestic labor [5]. Meanwhile, Le Corbusier proposed centralized high-rise buildings in park-like zones, prioritizing light, air, and hygiene [2]. In Amsterdam, Berlage's South Amsterdam Plan demonstrated urban zoning and brick modernism, blending vernacular with social planning ideals [6].

The American Context: Skyscrapers and Suburbia

While post-war Europe grappled with reconstruction and social reform through experimental housing initiatives, the American architectural response followed a markedly different trajectory. Across the Atlantic, modernism was molded by economic expansion, technological ambition, and the rise of consumer culture, giving birth to two contrasting but complementary forms: the skyscraper and the suburban home.

In the United States, the convergence of technological innovation, economic ambition, and urban growth catalyzed a unique modern architectural response. Nowhere was this more visible than in the rise of the skyscraper, a typology that symbolized both the ingenuity and capitalist dynamism of American cities. Beginning in the late 19th century, architects and engineers in Chicago and New York began experimenting with steel-frame construction, allowing buildings to rise to unprecedented heights. The Home Insurance Building (1885) by William Le Baron Jenney is considered the first skyscraper, using a steel skeleton to reduce wall mass and permit large windows. Louis Sullivan advanced the typology with structures such as the Wainwright Building and the Guaranty Building, where he introduced a tripartite composition (base, shaft, capital) and emphasized verticality through ornamented piers [7]. The early 20th century brought a wave of iconic towers, including the Woolworth Building (1913), the Chrysler Building (1930), and the Empire State Building (1931). These structures not only showcased stylistic influences such as Neo-Gothic and Art Deco but also fulfilled functional demands for dense urban commercial space. Setback regulations, such as the New York Zoning Resolution of 1916, shaped the step-like forms of many towers, ensuring light reached street level. Raymond Hood's Radiator and McGraw-Hill buildings exemplified this regulatory response combined with modernist abstraction.

Parallel to urban verticalism was a suburban movement that reimagined American domestic architecture. Suburbia grew in response to both population pressures and cultural desires for privacy, nature, and home ownership. Architects like Frank Lloyd Wright responded by developing regional styles rooted in American landscapes. His Prairie School homes, particularly the Robie House (1909), emphasized horizontal lines, open plans, and integration with the site. Later, in California, Wright experimented with concrete textile blocks, producing works like the Ennis House (1924) and the Freeman House, drawing influence from Mayan motifs and desert conditions [1]. The modernist suburban response also included European émigré architects. Rudolph Schindler and Richard Neutra, both influenced by the Bauhaus and Viennese modernism, brought a fresh sensitivity to climate, light, and material. Schindler's Lovell Beach House and Neutra's Lovell Health House are integrated into modernist form with California's coastal environment. These works anticipated postwar Case Study Houses and the evolution of mid-century modernism. Thus, American modern

architecture developed on two fronts: the symbolic, commercial skyscraper and the regionally adaptive, environmentally responsive suburban home. Both forms contributed significantly to international modernist discourse, reflecting the technological, cultural, and geographic diversity of the United States.

The Bauhaus and Global Synthesis

As American modernism developed in parallel with European movements, the international transmission of ideas became increasingly evident. Nowhere was this more impactful than in the educational innovations of the Bauhaus, which redefined architecture as a synthesis of craft, technology, and ideology, and whose diaspora helped globalize modernist thought.

Walter Gropius founded the Bauhaus in 1919 in Weimar, Germany, with the vision of bridging the divide between artistic expression and industrial functionality [7]. Emerging after the social and political upheavals of World War I, the Bauhaus school represented a radical shift in architectural education and design philosophy [1]. Rather than viewing architecture as an isolated discipline, Gropius emphasized the integration of art, craft, and technology—what he called the 'total work of art.' This approach marked a significant departure from the Beaux-Arts tradition and aligned with the needs of a machine-driven society.

The Bauhaus curriculum was structured around foundational courses in form, color theory, and materials, led by artists such as Johannes Itten, Paul Klee, and Wassily Kandinsky [2]. The architecture department, later developed in Dessau, incorporated industrial production and structural rationalism, with Gropius's own Bauhaus building (1926) serving as a prototype for modernist design. Its glass curtain wall, flat roofs, and interconnected volumes exemplified the clarity, transparency, and horizontality that would characterize the International Style. The influence of the Bauhaus extended beyond Germany. As the Nazis forced the school's closure in 1933, many of its faculty emigrated abroad, spreading its principles globally. Mies van der Rohe, who succeeded Gropius as director, carried Bauhaus ideals to the United States, notably in his work at the Illinois Institute of Technology. Meanwhile, Hannes Meyer emphasized social purpose in design, directing attention to housing and egalitarian urban solutions. Bauhaus-trained designers influenced American modernism, Israeli Bauhaus architecture in Tel Aviv, and post-war reconstruction in Europe. Ultimately, the Bauhaus transformed architecture by promoting interdisciplinary collaboration, material experimentation, and design efficiency. Its legacies persist in modern design education and in the minimalist and functionalist approaches that define much contemporary architecture. The International Style was canonized by Hitchcock and Johnson (1932), emphasizing volume over mass and the absence of applied ornament [8]. Droste (2002) notes that the Bauhaus curriculum evolved toward an emphasis on standardized housing and industrialized materials [9].

Architecture and Ideology: Soviet Constructivism

Soviet architecture after 1917 positioned itself as a visual instrument of revolution. Vladimir Tatlin's Monument to the Third International (1919–20) symbolized liberation through kinetic spirals and transparent forms [7]. El Lissitzky's 'Proun' compositions and the Cloud Iron series investigated spatial composition through geometry and modularity [7]. The Narkomfin Building by Ginzburg (1928–30) demonstrated communal living ideals, separating circulation, services, and social interaction into distinct but coordinated volumes [3]. These architects hoped to align the built environment with socialist principles and the collective good.

Architectural Material and Movement Analysis

While Soviet Constructivists leveraged architecture for ideological expression, other modernist movements focused on the material and spatial logic underpinning design innovation. The evolution of building materials not only transformed architectural form but also reflected the intellectual and social ambitions of modernism itself. As new materials like steel, reinforced concrete, and glass became widely available, architects began to explore how these could shape a new spatial order — one defined by transparency, efficiency, and structural honesty.

This section presents a comparative analysis of material usage and its evolution across key architectural periods, examining how technological innovation informed both construction methods and aesthetic symbolism. (Figure 1) illustrates the varying proportions of steel, concrete, and glass used in iconic modernist structures such as Le Corbusier's Unité d'Habitation, Gropius's Bauhaus Building, and Wright's Fallingwater. These comparisons highlight the material preferences aligned with regional and ideological differences in modern design.

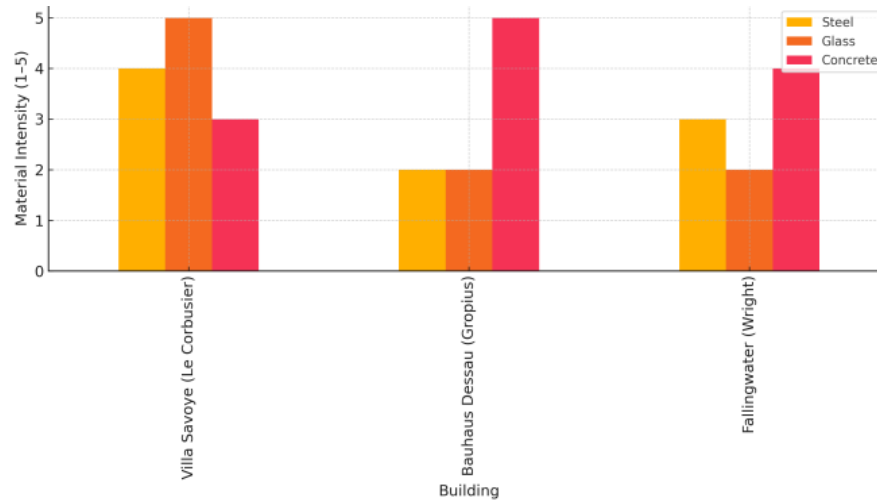


Figure 1. Material Usage Comparison in Iconic Modern Buildings

(Figure 2) compares how movements like Bauhaus, Constructivism, and De Stijl employed key materials. The chart emphasizes the alignment of material usage with design philosophy, such as the Constructivists' focus on steel and concrete for ideological symbolism and functional clarity.

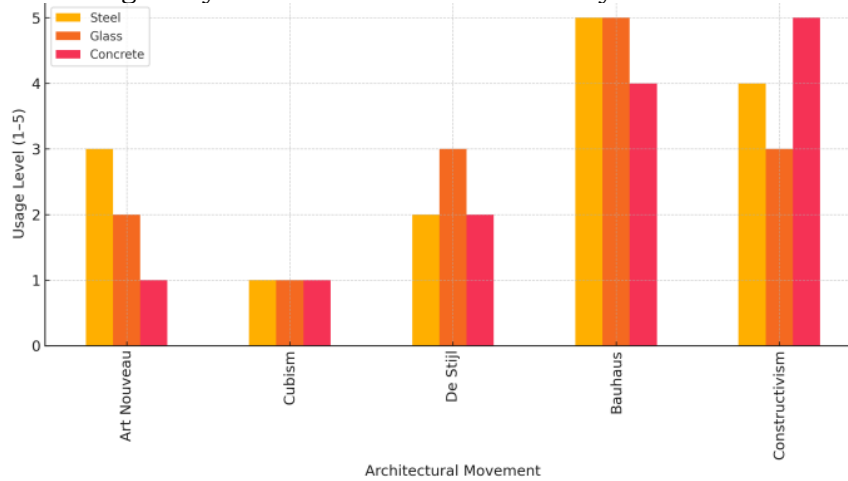


Figure 2. Comparative Use of Materials in Modern Architecture Movements

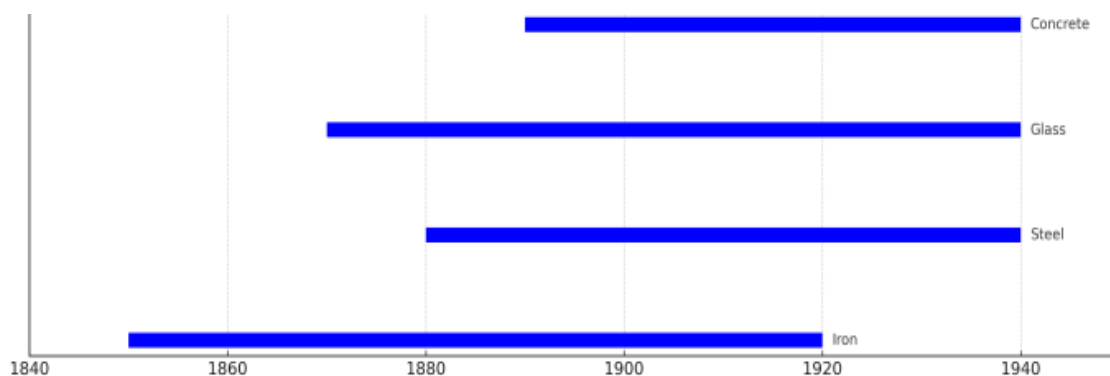


Figure 3. Historical Material Use Timeline in Architecture (1850-1940)

Iconic Building Comparison

The diagram below compares iconic buildings from different modern movements by their use of primary materials: steel, glass, and concrete. It reveals contrasting approaches between machine aesthetics and organic integration, showcasing how architects like Le Corbusier, Gropius, and Wright manipulated materials for both structural and expressive goals.

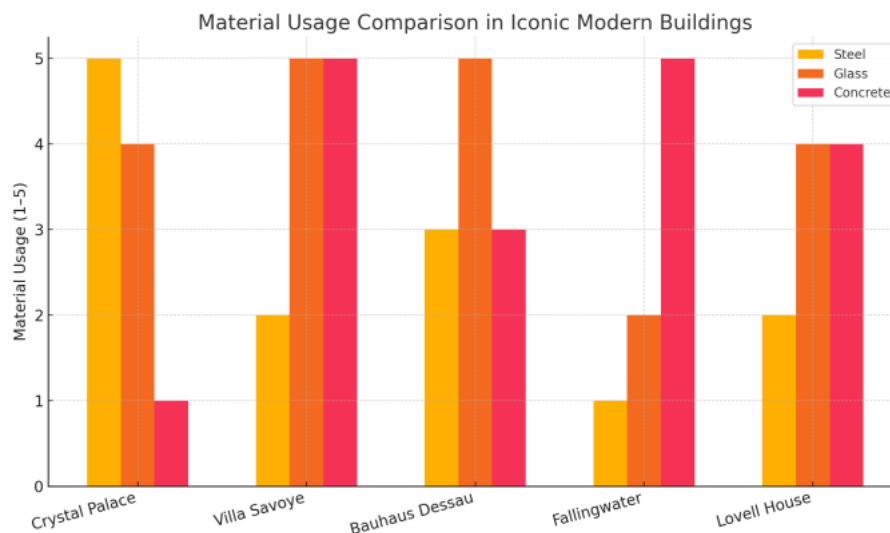


Figure 4. Material Usage Comparison in Iconic Modern Buildings

(Figure 4) re-emphasizes key differences in how individual architects leveraged materials. Le Corbusier's concrete-centric projects are contrasted with Gropius's steel-glass frameworks and Wright's use of organic integration, particularly visible in Fallingwater's harmony with natural surroundings.

Comparison Between Modern Architecture in Europe and the United States

The comparison between Europe and the United States reveals a fundamental difference in motivations and approaches within modern architecture. In Europe, modern architecture emerged in response to social and political crises, especially after World War I. Movements such as the Bauhaus and De Stijl aimed to create functional, aesthetic solutions for the new industrial society. In contrast, in the United States, motivations were often commercial and economic, focusing on creating capitalist icons such as the skyscrapers in New York and Chicago.

Table 1. Comparison Between Modern Architecture in Europe and the United States

Aspect	Europe	United States
Primary Motivation	Social reform, reconstruction, and industrial transformation	Economic growth, corporate expression, and urban expansion
Driving Forces	War aftermath, socialist ideals, worker housing	Capitalism, commercialism, and real estate development
Key Figures	Le Corbusier, Walter Gropius, Ludwig Mies van der Rohe	Frank Lloyd Wright, Louis Sullivan, Richard Neutra
Urban Approach	Zoning, public housing, pedestrian-centric urbanism	Skyscrapers, gridded cities, automobile-centric suburbia
Technological Influence	Prefabrication, reinforced concrete, minimal detailing	Steel-frame construction, curtain walls, and elevators
Symbolic Role	Collective progress, egalitarian ideals	Power, progress, and individual success
Educational Model	Bauhaus, CIAM, functionalism, state-driven agendas	Private practices, pragmatic experimentation
Notable Movements	Bauhaus, De Stijl, Constructivism	Prairie School, International Style (adapted), Art Deco
Notable Buildings	Bauhaus Dessau, Weissenhof Estate, Unite d'Habitation	Robie House, Chrysler Building, Fallingwater

Impact of Modern Architecture on Urban Communities

Modern architecture played a significant role in shaping modern cities by: Developing collective housing systems (e.g., Siedlungen in Germany); Introducing zoning concepts and separating urban functions; Enhancing the relationship between public spaces and buildings. However, some of these projects were later criticized for creating inhumane urban environments, particularly in large housing complexes that neglected social and cultural dimensions.

Criticism of Modernism and the Transition to Postmodernism

Colquhoun (2002) emphasized how modernism's claims to universality often masked Eurocentric assumptions and aesthetic dogmatism [9]. By the 1970s, modern architecture began facing criticism: Accused of monotony and coldness: Over-reliance on rectangular forms, white color, and glass, and disconnection from cultural context: Ignoring local identity in favor of universal function.

The Postmodern movement emerged in reaction, calling for the revival of symbolism, pluralism, and diversity in form and meaning. Figures such as Robert Venturi and Charles Moore became prominent in this context.

Conclusion

Modern architecture marked a turning point in how people think about design, materials, and society. It replaced decoration and imitation with honesty, clarity, and purpose. Industrial advances introduced new materials like steel and concrete, while artistic and social movements inspired architects to design buildings that were functional, democratic, and expressive of their time. Movements such as the Bauhaus, De Stijl, and Constructivism connected art, technology, and social ideals, laying the foundation for today's architectural thinking. Although modernism has been criticized for sometimes ignoring local culture and human experience, its influence remains strong. It encouraged architects to design with reason and creativity—to balance progress with responsibility. Modern architecture's real legacy is not just in its buildings but in its lasting message: that architecture should serve people, reflect its era, and continue to evolve toward a more thoughtful and sustainable future.

Acknowledgments

The authors gratefully acknowledge the support and resources provided by the research community around the world.

Conflict of interest. Nil

References

1. Collins P. Concrete: the vision of a new architecture. Montreal: McGill-Queen's University Press; 2004. p. 57–75.
2. Curtis WJR. Modern architecture since 1900. 3rd ed. London: Phaidon Press; 1996. p. 21, 43, 137, 201, 246.
3. Gebhard D. Schindler. Salt Lake City: Gibbs Smith; 1997. p. 76–95.
4. Heynen H. Architecture and modernity: a critique. Cambridge (MA): MIT Press; 1999. p. 88.
5. Colquhoun A. Modern architecture. Oxford: Oxford University Press; 2002. p. 96, 111.
6. Frampton K. Modern architecture: a critical history. 5th ed. London: Thames & Hudson; 2020. p. 37, 85, 103, 159, 212.
7. Cooke C. Russian avant-garde: theories of art, architecture and the city. London: Academy Editions; 1995. p. 43, 52.
8. Hitchcock HR, Johnson P. The international style. New York: W. W. Norton & Company; 1932. p. 12, 42, 55.
9. Droste M. Bauhaus, 1919–1933. Cologne: Taschen; 2002. p. 48.