

Architectural Features of Museums Formation During the XX–XXI Century

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Abstract. This article provides an architectural analysis of renowned museums worldwide and a review of museum classification. Since the typology of museums is essential in museology, the purpose of this study is to demonstrate the wide range of museum types, structures and ideas, as they have evolved.

The first part will reveal the different types of museums classification, while the subsequent part will explore the museum architecture features, including their functionality and design concepts. This will involve the categorical method, systematic approach, and structural analysis to establish different typologies of museums and illustrate the evolutionary philosophy of museum development. The findings indicate that architects strive to diffuse their creations with a high level of expressiveness, sharing some distinctive features, and drawing on a holistic understanding of museums as an architectural piece of art.

Keywords: Museums Architecture · Museums Features · Museums Evolution

1 Introduction

Modern museum buildings are places where commerce, creativity, and culture converge, with architects being tasked to craft iconic structures that serve as symbols of the cities they inhabit. Further, museum architecture frequently acts as a striking visual centerpiece for the urban landscape, offering architects an ideal platform to showcase bold and innovative designs. According to the ICOM definition, a museum is a permanent, non-profit institution that aims to benefit society and contribute to its development. It is open to the general public and focuses on acquiring, researching, popularizing, and exhibiting material evidence related to individuals and their environments for educational and spiritual purposes [3]. Thus, the museum is a multifunctional social institution whose functions tend to grow.

Nowadays, many countries around the world are undergoing a significant construction boom of museums, primarily driven by advancements in science and technology, where museums are now in various forms, have different typologies and serve different purposes, ranging from art museums and history museums to science centers and cultural heritage institutions. By other means, "the typology of museums can be compared to the typology of books: (a) there are scientific books that present the results of a special

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research work of one scientist for other scientists; (b) educational ones intended for students; (c) popular ones designed for a wide range of readers[1]". Ergo, to gain insights into the diverse functions, structures, and missions of different types of museums, a study of museums classification and typology should be carried out.

Thus, the aim of this study is to identify the different components and features of museum's architecture, and to understand the underlying principles driving the museums evolution, by answering whether modern museums have common traits or not. To achieve this goal, the first part presents various museum classifications, followed by an examination of 8 renowned museums, encompassing architecture, functionality and design principles. This entail utilizing categorical methods, systematic approaches, analyses and comparison.

2 Materials and Methods

2.1 Museums Classification

The museum classification arose in the 1960s – 1980s in connection with the development of a network of museum ensembles and museum reserves. The typology of museums for public purposes was adopted in Soviet museology and is associated with the main category of visitors with whom the museum works: specialists, a wide range of tourists, students, children [7]. One of the most important categories of classification is the profile of the museum, that is, its specialization because museums are one of the main types of multifunctional buildings. And according to the Oxford English Dictionary, typology is defined as "the study of classes with common characteristics; classification, especially of human products, behavior, characteristics, etc., according to type; the comparative analysis of structural or other characteristics; a classification or analysis of this kind" [9].

Museum typology is essential for the development of the museum system and for the implementation of museum activities. The classification includes: historical museums [1, 4–6]; art museums [2–5]; literary museums [2, 4, 5]; Natural science museums [2–4, 7]; technical museums or science and technology museums [2, 4, 7]; scientific-educational museums [1]; branch museums [2, 4]; complex museums [2, 4, 7]; research and educational museums [7]; children's museums [7]; architectural museums [4]; musical and theatrical museums [5]; etc. Besides, while there are various types of museums, the most popular museums globally are art, history, science, and general museums, suggesting that all subjects can be equally popular [6]. Below, is a short description of some museum's classification provided with examples:

- The first famous type is the historical museum. Its primary goal is to chronicle and document a series of events or a complex representing a specific moment undergoing change [1]. For example, the State Historical Museum in Moscow and the Acropolis Museum in Athens. Moreover, by saying historical museum, it also groups the military historical (such as, the Central Museum of the Great Patriotic War of 1941–1945

[1] Schmit F. I. Museum business (in Russian). Questions of the exposition. L.: Academia, 1929. p. 245.

in Moscow), ethnographic, archaeological (like the archaeological museum reserve "Tanais"), religious history, historical personal, historical monograph (event), the history of individual enterprises [2], the Museum of political history (like the Museum of Political History in St. Petersburg) [3].

- Another famous type is art museums. Art museums include museums of fine arts, decorative and applied arts, folk art, palace, decorative and park art, personal art, and monographic art museums [2–5]. The group of art history museums consists of museums of theatrical art, musical art and musical instruments, photography and cinema, personal art criticism, and monographic art criticism [2, 4]. Hense, these museums focus on art, sometimes of a particular style, region, era, or a specific theme. For example: Guggenheim Museum (1959); The Neue Nationalgalerie (1968); Centre Georges Pompidou (1977); The High Museum of Art (1983); Guggenheim Bilbao (1997); Kunsthaus Bregenz (1997); Museu Oscar Niemeyer (2002); Louvre Abu Dhabi (2007); etc.
- Natural science museums cover geographical museums, biological (botanical, zoological, museums of living objects), geological (paleontological, mineralogical), soil science museums, anthropological, and medical [2]. They might also be called museums of a complex profile [3, 7], e.g.: The Central Museum of Soil Science named after V. V. Dokuchaev in St. Petersburg (1904) and the V. R. Williams Soil and Agronomy Museum in Moscow (1934).
- The science museum conveys the scientific spirit and mindset in three dimensions, to stimulate a natural desire for knowledge, and to provide information about research and development. This type includes museums of natural sciences, museums of applied sciences and museums of technology (polytechnic) [1, 7], such as the Central Museum of Physical Culture and Sports, founded in 1988.
- Branch museums are represented by agricultural, pedagogical, health, sports, branch personal, branch monographic museums [2, 4] like mining, shoe industry, and it can even be related to theater, music, cinema, etc.
- Complex museums include museums of local lore, architecture and history, architecture and ethnography, historical and artistic, literature and art, medicine and healthcare [2, 4].

2.2 Exploration of Art Museum

After outlining the characteristics of museum classification, in line with the research objective, we examine the architecture of 8 various Art museums as examples, to identify any commonalities among this type of museum This exploration is motivated by the evolving role of museums since the mid-twentieth century, where museums have been acting not only as a repository, research, exhibition and cultural and educational center, but also as a tool for socio-cultural transformations. Therefore, the museums' analysis from the point of view of a systematic approach is associated with the consideration of its institutional nature, socio-cultural functions and the development of museum classification schemes.

Guggenheim Museum (1959)—Frank Lloyd Wright. A renowned art museum and one of the most considerable architectural icons of the XX century designed as an artistic, vast and organic sculpture, in an urban center in New York [8]. Wright stressed the need

for significant change and envisioned both architecture and social reform as an ongoing process rather than a pursuit for some static absolute ideal; by this he expressed a vision for the role of architecture in reshaping American society [10].

Solomon R. The Guggenheim Museum had been on Wright's drawing boards for years before construction began, and was opened to the public shortly after Wright's death in 1959. The Guggenheim Museum was the first building design in which Wright destroyed everything square and rectangular. It was a peculiar-looking building, with an inverted cone [12]. Like many previous Wright works, this structure featured a vast interior space. A quarter-mile ramp ascended gradually in a spiral to a height of seventy-two feet, culminating in a high skylight dome to allow ample natural light and space. Visitors take an elevator to the top and amble down a gentle spiraling ramp viewing artworks in the process. The floor is supported and braced from the enclosing wall, with one floor seamlessly transitioning into the next, instead of the usual superimposition of the stratified layers cutting and butting into each other by post and beam construction. Finally, the building material is reinforced concrete.

Given that the Guggenheim Museum demonstrates a sculptural expressiveness, the extremely "free" boundaries of the object are clearly defined (and calculated on the computer) in their ultimate state - the feeling of peak tension is brought by the architect to the grotesque. The iconicity of the artistic image allowed the architectural structure to become a recognizable landmark. As a result, the transitional type from a separate volume to a developed complex represents the dynamic boundary of the museum's form, creating a sense of movement and openness within the space. This technique is common in the works of Richard Meier, Kisho Kurokawa, Christian de Portzamparc. Upon its completion in 1959, the museum's design was notably modern, featuring distinctive elements such as the use of poured concrete, its open atrium, its dramatic walkway [10]. These design choices reflected Wright's core principles of decentralization, human scale, inside-out and outside-in planning, space in motion, character, materials and ornament [11]. For Wright, "what we did yesterday, we won't do today. And what we don't do tomorrow will not be what we'll be doing the day after". Nevertheless, Mies van der Rohe's philosophy was just the opposite: "You don't start a new style each Monday[2]" - he argued.

However, the approach to museum architecture shifted in the era of contemporary design. Prior to the 1950s, museums were primarily seen as a beautiful shell to house collections, often resembling temples or palaces. Nevertheless, in the 1960s, Miss Van der Rohe, based in Berlin, introduced the new concept of the temple-museum.

The Neue Nationalgalerie (1968)—Mies van der rohe. Mies van der Rohe and Le Corbusier embraced a design approach that rejected traditional styles, the use of theories and principles derived from the industrial world and the belief in the ethical and social role of architecture and urbanism. Their iconic Modernist works are integral to architectural history, not just due to their chronological placement, but because they exemplify innovation in design and construction methods, while symbolizing the values of a city, society, and historical era [13]. If dissolution is found in Le Corbusier's aspect, then

[2] Tafel's discussion of Mies and his visit to Taliesin can be found in Edgar Tafel, Years with Frank Lloyd Wright; Apprentice to Genius. McGraw-Hill, 1979, p68–80, the quote is found on p70.

Mies van der Rohe expanded the universal space in his design and shaped his personal vision of space and architecture through an imposing steel and glass temple of modern, reinterpreting the classic style starting from its rules, laws and forms, and with the technique of his time in an innovative way, expressing a geometry based on a rigorous measurement and careful proportioning. This created metaphysical spatial properties. Indeed, every component of the museum structure is meticulously planned based on a fundamental 1.20x1.20-m module. This includes the granite slabs of the podium, the coffered steel cover, the structural grid of the lower floor, the length of side of the roof and that of the main hall, the height of the steel and glass facade, the height of the main hall, which influences the division of the space below according to the golden ratio of 5:8:5 [14]. Hence, every architectural aspect in this museum is pushed to its limits: the construction techniques, the structural constraints, the size of the columns, the wideness and emptiness of the space. The structural system, featuring a steel frame with large glass panels, creating a simple square layout, allows for an open and transparent facade, blurring the boundaries between the interior and exterior spaces. On the other side, inside the gallery, Mies van der Rohe's signature minimalist aesthetic is evident, with simple, clean lines and an emphasis on spatial purity. The interior spaces are designed to be flexible and adaptable for showcasing a variety of artworks. As a result, the emergence of the concept of universal space proposed by Ludwig Mies Van der Rohe, in many ways, influenced the development of a new type of exhibition space, which became one of the most commonly used in modern museums. Mies van der Rohe said "I try to make buildings a neutral frame in which people and works of art can live their own lives. This requires modesty […] This is the only way to create free space" [13, p.60].

Thus, the Neue Nationalgalerie stands as a testament to Mies van der Rohe's mastery of modernist principles, showcasing a timeless elegance and a focus on structural clarity and spatial openness. It is a place of artistic enjoyment, not a place of isolation of works of art. Accordingly, the museum is considered an icon of the twentieth century and part of the legacy of the architect and is described as the ideal embodiment of the ideas of a "flexible container" [15].

Centre Georges Pompidou (1977)—Renzo Piano. Piano's architectural designs place a strong emphasis on functionality, sustainability, and spaces that prioritize the well-being of those who inhabit them. His commitment to creating buildings that inspire and elevate is evident in his focus on structures that not only serve their intended purpose but also have a positive impact on their surroundings and the people who interact with them. Natural light, ventilation, and green spaces are integrated into his designs, fostering a seamless connection between the built environment and nature. This is best shown in the Centre Georges Pompidou, also known as the Pompidou Center – a cultural complex in Paris, celebrated for its innovative and unconventional architectural design and is classified as structural expressionism, also as high-tech or late modernism [9]. It's one of R. Piano's most iconic creations because it exemplifies his innovative and unconventional design approach. Its unique exterior, featuring exposed steel framework and colorful pipes, defies traditional architectural aesthetics. Piano aimed to establish a structure that promotes transparency and openness, where people could engage with art and culture. Thus, this museum serves as a testament to Piano's dedication to pushing design boundaries and creating dynamic, interactive spaces [16].

The most distinctive feature of the Pompidou Center is its "inside-out" design, where structural components such as escalators, elevators, and mechanical systems are positioned on the building's exterior. This atypical arrangement creates open and versatile interior spaces, enabling unobstructed exhibition areas that can easily adapt to a range of cultural and artistic activities. By eliminating structural columns, the design provides uninterrupted exhibition spaces and facilitates the showcasing of large-scale artworks. During the day, the interior space is transparent and open to the outside eye, and in the evening, it seems like a light sculpture with recognizable architectural structures [17].

Summarizing, the Centre Georges Pompidou's radical architectural design has made it an iconic symbol of modern architecture and a major landmark in Paris. Its innovative approach to form, function, and urban integration continues to inspire architects and visitors from around the world. Consequently, the architecture of the R. Piano is characterized by the universal language of pure geometry - light, space, volume.

The High Museum of Art (1983)—Richard Meier. One of Richard Meier's distinctive architectural features is the integration of natural surroundings into his designs. This is evident in the Museum Angewandte Kunst in Frankfurt (museum of applied art - 1985), where the building incorporates green patios and square "windows" that visually connect the interior with the natural environment. Meier's work also includes various typological models of museums at different urban planning scales, with new structures harmonizing with their surroundings, as seen in the Getty Center in Los Angeles (1997). Additionally, Meier is known for creating separate sculptural volumes based on the concept of a "modernist box," as seen in the Barcelona Museum of Contemporary Art (1995) and the Athenaeum in the USA (USA, 1979). Meier is perhaps the best known of the group for his use of white in his designs, which enhances the qualities of light in space, since he believes that whiteness helps distinguish between opacity and transparency, solid and void, and structure and surface in his designs [18].

The High Museum of Art is a major public building and art repository that responds to the typological and contextual aspects of the museum's program. R. Meier embodies the modernist utopia (Corbusier dream of a "white world"), making it an equal member of interaction in the urban context. The composition of the structure is formed on the basis of the identification and analysis of urban planning lattices and attention to the context [12]. The museum refers to the typological aspect of a museum's program because it is created by a series of interconnected and distinct gallery spaces that are designed to showcase a variety of art forms. Meier's design incorporates large, open galleries with natural light, as well as more intimate and enclosed spaces, providing a range of environments suitable for different types of art. Additionally, the museum's layout and circulation paths are carefully considered to guide visitors through the various collections and exhibitions in a logical and engaging way. The floor plan is divided into four quadrants, with one quadrant carved out to create a distinctive monumental atrium, serving as the museum's lobby and ceremonial center. An extended ramp symbolically reaches out to the street and city, contrasting with the interior ramp, which serves as the building's primary formal and circulatory element. At the end of the ramp is the main entry and reception area, leading into the four-story atrium. This light-filled space is inspired by and provides commentary on the central space of the Guggenheim Museum. Unlike the Guggenheim, where the ramp also functions as a gallery, in Atlanta, the separation of circulation and

gallery space allows the central space to dictate movement. This separation also allows the atrium walls to have windows, bringing in natural light and offering framed views of the city.

The tendency of volumes contrasting in geometric characteristics and in the facades, arrangement can be interpreted as a continuation of the tradition of modernism. Therefore, the figurative structure of R. Meier's museums and the "white architecture" has become his trademark. An untouched white sheet, an assumption of inspiration, and an illusion of an encompassing emptiness became metaphors for the museum of creativity. The method of geometric proportioning based on orthogonal lattice is used in all stages: from the organization of the scheme of the volumetric-spatial composition to the arrangement of the exterior shape of the building [12]. In a generalized form, the geometric concept of the proportion portrays some particular approaches:

- The use of a universal language of pure geometry;
- "White architecture**"** as the embodiment of the synthesis of the figurative metaphors;
- Museums as a creative laboratory of style;
- The use of an ideal and complete circular form of museums, which determines the dominant role of the structure in urban planning, architectural, artistic and social aspects: building-center and building-landmark.

However, Meier not only embraced modern architecture and pure form, reminiscent of Le Corbusier's work in the 1920s and 30s, but also shared a similar aesthetic with Peter Eisenman, Charles Gwathmey, Michael Graves, and John Hejduk, who were commonly called "the Whites".

Guggenheim Bilbao (1997)—Frank Gehry. One of the most iconic instances of architecture catalyzing urban revitalization is the creation of the Guggenheim Museum in Bilbao, Spain, which was designed by the Canadian-American architect Frank O. Gehry and opened in 1997. The resulting "Bilbao Effect" gained widespread recognition after transforming the industrial port city of Bilbao into a must-see tourist destination [8]. For that reason, the Guggenheim Bilbao would ultimately become the seminal example of how museums, or cultural institutions in general, can be utilized to regenerate post-industrial cities and bring new investment and life into the city. The unusual form is open to many associations: the expression of modern art, as well as metaphors for a ship, mountains, etc. The composition of shiny metal sheets at first glance is devoid of any order, starting to spiral and getting lost in a pile of metal. In fact, the structure acquires memorable and very different silhouettes when moving around, characterized by paradoxical integrity. The use of the reflective properties of titanium made it possible to transform the appearance of the museum during the day: at sunrise it looks silver-plated, during the day it is lost in a dazzling shine, and at sunset it acquires a golden tint. Lighting effects are also absorbed in the interior space: the refractions of the upper light from the central atrium contrast with the diffused dim light of the exhibition halls. The possibility of such an interpretation of the form is largely due to the introduction of high-tech glazing systems. Further, it has revealed extensive possibilities in both conceptual and artistic realms, transforming glass from a mere material into a convergence of technology and imagery. The trend towards "transparency" aligns with broader social

and cultural movements in modern society, where "transparent architecture" has been widely adopted in museum design, enabling spatial synthesis and emphasizing on the contemporary conceptual art, which encourages viewer participation. This typology of museums reflects a social openness, in contrast to the traditional: "palaces of arts". In brief, it can be assumed that the use of glass in museum architecture best reflected the concept of "modern", including paradox, variability, and "transparency" as integral characteristics. The architecture of glass deliberately hides its formal-constructive nature, shifting the emphasis to the relationship of the object with the environment and its information filling [12].

The grotesque and at times aggressive visual impact, accentuated by the interplay of volumes and rugged finishes, imparted a sense of self-containment and autonomy to the multifunctional building, effectively distinguishing it within the urban landscape. As a result, the geometric design, layered volumes, and spatial composition are prominently showcased, highlighting the building's distinctive architectural character.

Kunsthaus Bregenz (1997)—Peter Zumthor. The architecture of the Museum Kunsthaus Bregenz is characterized by its striking, minimalist design and its seamless integration with its natural surroundings. Designed by the Swiss architect Peter Zumthor and completed in 1997, the museum is recognized for its innovative and thoughtful approach to exhibition spaces and architectural form. The museum's design and layout are tailored to provide an immersive and contemplative experience for visitors, allowing them to engage with the art in a thoughtfully curated environment. It's true that Zumthor's design for the Kunsthaus Bregenz features a minimalist and monolithic exterior, expressed with the clean lines and simple form, but this museum has key architectural elements, such as:

- Glass and Concrete Structure: The museum's exterior is primarily composed of glass and concrete, creating a clean, geometric form that allows natural light to flood the interior spaces. The use of glass also enables visitors to enjoy unobstructed views of Lake Constance and the surrounding landscape.
- Floating Exhibition Spaces: The museum's interior consists of a series of floating platforms that house the exhibition galleries. These platforms are suspended within the building, creating a sense of weightlessness and flexibility in the display of artwork.
- Integration with Nature: The museum is harmonized with its natural setting. The reflective glass facade mirrors the water and sky, blurring the boundary between the building and its environment. This adds its visual impact and makes it a landmark.
- Minimalist Interior: Inside, the museum features a minimalist, open-plan interior with clean lines and unobtrusive detailing. This design approach allows the focus to remain on the art, creating an immersive and contemplative environment for visitors. Thus, the internal has no connection with the external.

In result, the combination of these architectural features not only provides a dynamic space for art but also functions as a work of art in its own right. The museum's architecture mirrors Zumthor's commitment to creating an environment that enriches the experience of contemporary art while interacting with the natural and cultural context of its setting. It serves as a crucial component of the overall adventure experience. In summary, the

Museum Kunsthaus Bregenz's identity as a contemporary art museum is shaped by its innovative architecture, commitment to presenting modern art forms, and its harmonious integration with its surroundings [19].

Museu Oscar Niemeyer (2002)—Oscar Niemeyer. The Museum of Modern Art project in Caracas (1955) by O. Niemeyer was seen as a departure from modernist aesthetics in favor of a more expressive approach: "*a new stage, a stage in the search for purity and conciseness of forms*" [20, p. 62].

The Museu Oscar Niemeyer, also known as the "Eye Museum" due to its distinctive eye-shaped design, is a prominent architectural landmark in Brazil. The structure was conceived as a sculptural interpretation based on visual contrast. O. Niemeyer designed the museum in the shape of a tetrahedral pyramid situated atop and open to the sky's light - creating a striking contrast between the simplicity and seclusion of its external appearance and the openness and adaptability of the internal space, filled with light and air. In its relationship with the landscape, the desire to synthesize contrasting principles is also evident: attempting to blend into the surrounding landscape, which calls for compact monumental forms that sharply stand out from it [20, p. 64]. The Museu Oscar Niemeyer is distinguished by its exterior, predominantly constructed with concrete and glass, materials closely associated with Niemeyer's architectural style. The interplay of these elements creates an impression of weightlessness and transparency, enabling natural light to suffuse the interior spaces. The unexpected three-dimensional design dictated the layout of the internal areas. In the lower section, distanced from natural light sources, Niemeyer positioned the lobby, auditorium, and service rooms, while in the well-lit upper levels, he placed expansive exhibition halls, freeing them from supporting columns. The roof, intended to serve as both a protective covering and a means of connecting the inclined walls, also functioned as a large light diffuser and sunshade. Additionally, it featured platforms for displaying sculptures. The symbolic complexity of the form was conceived in multiple layers, aiming to embody the creative spirit of contemporary art and the development of Venezuela [20]. Simultaneously, the entire inverted pyramid structure of the museum stands in stark contrast to Le Corbusier's "growing museum" pyramid. The design, with its enclosed exterior and illuminated interior, evokes parallels with the spiraling form of Frank Lloyd Wright's Guggenheim Museum in New York. Moreover, within the museum, visitors are greeted by expansive and fluid exhibition spaces that embody Niemeyer's dedication to crafting dynamic and welcoming settings for art and cultural engagement.

The Museum was the culmination of the architect's concept of expressive symbolism of form and stands as a testament to Oscar Niemeyer's visionary approach to architecture, showcasing his ability to create structures that are both aesthetically captivating and functionally innovative [12].

Louvre Abu Dhabi (2007)—Jean Nouvel. One of Jean Nouvel's latest works, is the Louvre Abu Dhabi - an architectural masterpiece opened in 2007. Nouvel's design for the museum features a stunning dome structure that appears to float above the museum, creating a unique and visually striking appearance. The dome, 180 m in diameter, is made up of eight layers of perforated steel and aluminum, allowing sunlight to filter through and create a "rain of light" effect within the museum. The streams of light flowing through the openings give the architecture additional dynamics and expressiveness. The

translucent ceiling is designed to reproduce the effect of light rays passing through the palm leaves. It is symbolic that its architecture resembles a desert.

The structure is based on the priority of rigid rectangular geometry and related principles of proportionality, where the architecture of the Louvre Abu Dhabi also incorporates elements of traditional Arabic design, such as the use of geometric patterns and intricate latticework, while also incorporating modern, minimalist elements. The result is a testament to Jean Nouvel's skill as an architect, creating a space that is both visually stunning and culturally where it also honors its cultural surroundings and stands as a symbol of contemporary architectural innovation. We can mention that this museum has several distinctive structural features making it a remarkable architectural marvel. Some of these features include: Reflecting Pools, Open Spaces and Natural Light. The museum is surrounded by a series of reflecting pools, which not only provide a visually stunning backdrop but also serve as a cooling mechanism for the building, helping to regulate the temperature within the museum. Additionally, The Louvre Abu Dhabi is designed to seamlessly blend indoor and outdoor spaces, with open plazas and courtyards that connect different parts of the museum. This design creates a sense of fluidity and openness throughout the complex. And finally, the design of the museum emphasizes the use of natural light, with strategically placed skylights and windows that allow sunlight to filter into the galleries and public spaces, creating a unique ambiance [21].

Describing the structure of his work, Nouvel uses sublime metaphors: the material of architecture is light, and language is glass. Transparency, light, abstraction, and concept are the key properties of Nouvel's architectural characteristics. It is quite fair to call the concept of J. Nouvel in museum architecture: the notion of intellectual dematerialization. As stated by Nouvel, the essence of architecture is a shell, a boundary at a given point in time, an event. According to the principle of dematerialization, the architecture of glass dissolves the form and fills it with unexpected illusions and mirages in reflections, glare, in layers of transparent volumes. At the same time, the formation of the volumetric-spatial composition of the structure is carried out on the basis of the priority of rigid rectangular geometry and the proportionality principles associated with it. The rational organization of the illusory world creates the impression of a second reality with a special, complex, order - the virtual space of architecture and art [12]. These features come together to create a museum that is not only architecturally stunning but also provides an immersive and culturally rich experience for visitors.

In closing and by all means, there are other architects expressing their concepts and ideologies in the museum foundation, like Tadao Ando and Arata Isozaki, where they used a sparse language of pure and minimalistic geometry as a symbolic signification in view of the fact that geometry interacts with natural factors including the sunlight and the water. Furthermore, in the aspect of the syntheticism of the museum's architectural environment, other architects raise the theme of intermediate, "empty" space and the use of its integrating potential while taking into consideration the intentional blending of various architectural styles, materials, and design elements to create a cohesive and harmonious space that enhances the overall museum experience.

3 Results

The museum's architecture analyses showcased the diverse array of museum categories, structures, and concepts as they have developed over time. It was found common traits of museums' architecture between the XX and XXI centuries, such as: (a) a decrease in interest of copying what was before, even if some architects attempt to create an architecture close to traditional museums; (b) an increase in the influence of evolution and technology by featuring innovative materials, striking forms, and cutting-edge technology to attract visitors and enhance the museum's cultural significance.; (c) an increase in the artistic and symbolic expressiveness of architectural solutions. Moreover, the analysis of museum architecture typology made it possible to cover a significant and informative volume of geometric and figurative characteristics of museum construction in the studied periods. This showed that the evolution of the typology of museum architecture of the XX-XXI centuries is characterized by new patterns and more freedom in the shapes, forms and concepts. These characteristics continue to shape the design of museums around the world, creating diverse and inspiring spaces for art, culture, and heritage. However, despite the endless variety of typologies and architectural solutions of museum, the layout of exposition spaces remains quite conservative, even in the most expressive forms, akin to the Guggenheim Museum in Bilbao which hides the most typical exposition plans.

The idea of museum formation is associated with the development of synthesizing symbolism of the artistic image, including: the concepts of signification of form formation (e.g. T. Ando); expressive symbolism (e.g. F. Gehry); abstract symbolism (e.g. J. Nouvel); and the metaphorical symbolism (e.g. O. Niemeyer). Finally, the variety of modern museum architecture style demonstrated various features in the structural construction; in the aspect of the formation of the concept of "development" in the functional and typological models; in the technological approaches to architecture; and in identifying the key pattern of museum's architecture growth according to the architect's concept. Table 1 gives a summary of modern museums features.

Table 1. The components and features of modern museums architecture.

Modern museum components	Features
The types of structural construction	• linear (in horizontal and vertical directions); • planar (regular and free organization); • volumetric (according to the sum of development vectors)

(*continued*)

Table 1. (*continued*)

Modern museum components	Features
The functional and typological models	• the growing Museum inspired by Le Corbusier, which involves an unlimited expansion of the building; • universal museum, much like Mies van der Rohe with the obligatory possibility of transforming the internal space; • spiral museum, including Frank Lloyd Wright's, which sets the schedule of the visitor's movement
The constructive and technological approaches to architectures	• technical: transformation, dynamism, mobility; • informative: social openness, intellectual game, mediation; • ecological: adaptive architecture, "green architecture", symbiotic architecture; • figurative and symbolic: technical and technological metaphors, symbols, signs
The key patterns of museum architecture growth according to the architect's concept	• the significance of the formation and symbolism of the museum's artistic image as a unique building (F. Gehry); • dematerialization of the boundaries of form as a conceptual contextuality (J. Nouvel) • "transparent" architecture (Mies van der Rohe);

Overall, the evolution of museum architecture typology in the XX-XXI centuries reflects a dynamic interplay between tradition and innovation, functionality and aesthetics, sustainability and technological advancement, and inclusivity and cultural identity.

4 Discussion and Conclusion

Today, museums are in continuous evolution, where museums configurations are in fact an important aspect. In the transition between the nineteenth and the twentieth century, the rise of the architects (such as Frank O. Gehry, Mies van Der Rohe, and Frank Lloyd Wright) resulted in the architecture overpowering the art inside. The result of this tendency revealed that the role of the architect is not limited to high-quality spatial design or to only attracting potential visitors' attention, but also concerns the definition of the public image and its identity, such as the Centre Pompidou - designed by Renzo Piano and Richard Rogers - encouraging the evolution of the museum as a container, but by also embracing eclectic styles, historical references, and playful design elements. Thus, following the XX century, architects explored various modern design approaches,

ranging from the classical geometric style of Mies van der Rohe's Altes Museum in Berlin to the innovative curvilinear designs seen in the Guggenheim Museums by Frank Lloyd Wright in New York City and Frank Gehry in Bilbao. The symbolic representation of the artistic image in museums, which evolved throughout the XX century, is still developing in the XXI century.

Nevertheless, certain museums share common features related to their structure, symbolism, technological approaches or other aspects (e.g. the use of glass and steel, creating a sense of transparency and openness). Although, the most recognized properties of museum architecture are informativeness, attractiveness, and expressiveness, where the proportional-geometric, universal and organic approaches, form the basis of modern concepts of museums growth. These aspects encompass a wide range of design considerations that create a successful and functional museum space, while also enhancing the visitor's experience.

To conclude, museum architecture is a dynamic field that constantly evolves to incorporate new technologies, materials, and design trends. By studying different typologies of museums, researchers and professionals can explore innovative approaches to architectural design and gain a deeper understanding of the diversity, complexity, and significance of museums. As well, to identify the museums' relationship with various scientific disciplines and cultural phenomena, aesthetic concepts and social characteristic of a particular era.

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