



## Light, Perception and Future Images in the Interior Design of the Brussels Atomium

### ABSTRACT

This research examines the production of light, perception and images of the future in the interior design of the Atomium in Brussels. The primary aim of the study is to demonstrate how the Atomium, which represented the scientific and technological developments of the future at the 1958 Brussels Expo, has been given new meaning today through light, sound and image-based exhibition practices. The research examines the relationship between the Atomium's unique architectural geometry and its contemporary exhibition design. A hybrid methodology, blending architecture, interior design and experiential design and based on a qualitative research approach, has been developed. Selected interior spaces of the Atomium have been analysed broadly using the Space Syntax method; the relationship between spatial arrangements, light and experiential design is identified. Definitions were established in accordance with the research methodology, based on records taken from visual documents following on-site observations of the light's colour, intensity, movement, rhythm and contrast. The results of the analyses revealed that the Atomium's historical futuristic concept, reinterpreted through contemporary exhibition practices, reflects an image of the future. Thus, the architectural image that once represented the future has been transformed into an interactive spatial experience where the future is sensorially experienced in the present day.

**Keywords:** Brussels, Atomium, Future, Spatial image, Interior design.

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### INTRODUCTION

Research into the future and explorations of its possible forms have led to the emergence of diverse spatial imagery within the architectural disciplines. In this context, the future can be regarded as a conceptual realm that has been given concrete form. Contemporary architectural theory also emphasises that the future is constructed through speculative ideas and spatial representations, and that architectural design can establish connections between the past and possible futures (Mayrhofer-Hufnagl, 2022). The Atomium in Brussels, built in 1958, is an example of a structure that, given the conditions of the time, embodied a futuristic approach and emphasised the future. Merjian (2025) states that futuristic thought in architecture can be given concrete form through expressions of technology, speed, modernisation and the future, as well as through spatial and visual representations. Within the context of today's innovations, the quest for the future and contemporary perspectives, the lighting show experience within the Atomium's interior spaces can recreate the image of the future.

The unique geometry of the Atomium structure is not merely a physical backdrop for the digital and multisensory exhibition applications realised today. Rather, it brings to life, through experience, the mental representation of images through sensory and cognitive perceptions. Multisensory exhibition environments can bring together different sensory channels to enhance visitor engagement (Carroll et al., 2024). Current exhibition research supports the view that technological and multisensory elements can transform the visitor from a passive observer into an active participant in the experience (Popoli & Derda, 2021; Ji et al., 2024). In this context, the expression of future visions within a space re-experienced through light, sound and movement can be deepened.

However, a review of the current literature reveals some research gaps. Some recent studies have examined the impact of digital and multisensory exhibitions on the visitor experience (Carroll et al., 2024; Fotiadi, 2024). Research on interior space experience and sensory perception, meanwhile, focuses on the relationship between the body, atmosphere and perceptual experience (Lee, 2022). However, these areas of research are mostly analysed in isolation. There is a need for a more integrated research framework that considers lighting design in conjunction with spatial layout and evaluates this relationship through the visitor's exhibition experience and their perception of a futuristic space. In particular, the re-experiencing of an architectural structure that

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historically represents the concept of the future, using contemporary lighting and sound technologies, can be regarded as an area that has not been sufficiently explored from this perspective.

It emphasises that the interior space experience is shaped by the relationship between the body, spatial perception and emotional connection (Lee, 2022). In exhibitions where digital projection, moving images, lighting and sound technologies are used in combination, spatial boundaries can be reinterpreted. Consequently, in contemporary exhibition design, the ways in which visitors move through the space, what they see, and the sensory stimuli they encounter have also become increasingly important (Carroll et al., 2024). Such applications can create a sound-visual spatial narrative that unfolds as the visitor moves through the space.

In this context, the aim of the research is to analyse the light-based exhibition experience within the interior spaces of the Brussels Atomium through the relationships between spatial layout, lighting design, sight-sound perception and the vision of the future. The research adopts a hybrid methodology with a qualitative focus. In the first stage, the spatial organisation of the selected exhibition areas is examined using the Space Syntax approach. In the second stage, the characteristics of lighting design including direction, intensity, colour, movement, rhythm, contrast and focus are analysed. In the third stage, these two sets of data are compared to assess the relationship between the lighting design and spatial hierarchy, visual accessibility and visitor movement. Within this framework, the study arrives at its conclusions by formulating the following research questions:

RQ1: How is a futuristic image reflected in architectural design?

RQ2: In interior design, can light, perception and experience influence individuals through a vision of the future?

## LITERATURE VIEW

### The Atomium, the 1958 Brussels Expo Structure

Exhibitions take place in a variety of contexts and organisations, serving multiple purposes. International exhibitions provide a platform for participating countries and companies to convey their images, articulate their visions for the future and showcase their technological advancements. These events are organised in such a way that they enable the presentation of future scenarios and scientific utopias rather than merely physical displays (Smith et al., 2025). One such event is a trade fair.

Trade fairs are important events that foster individual and social connections through promotion and exhibition. An “Expo”, short for “Exposition”, is an international trade fair held over a specific period to showcase countries’ cultures, innovations, and technological and economic developments. It was first held in London in 1851. It is the third largest global event after the FIFA World Cup and the Olympic Games (“Expo”, 2024). Since 1928, Expos have been organised by the Bureau International des Expositions (BIE), based in Paris (Smith et al., 2025). Since 1851, Expo fairs have been held in various national and international formats. As such, they are valuable events that promote innovative approaches and facilitate the sharing of global developments.

Whilst trade fair organisations provide a direct showcase for urban and architectural experiences, they also offer a chance to experience visions of the future through innovation. International exhibitions feature imagery that reflects industrial power as a paradoxical reflection of political, commercial and popular culture (Smits & Jansen, 2012). Since 1851, Expos have contributed to shaping the urban morphology of the host countries. Among the structures of high symbolic value from the past to the present, iconic buildings such as the Eiffel Tower (Paris 1889), the Atomium (Brussels 1958) and the Space Needle (Seattle 1962) feature prominently (Smith et al., 2025). As part of the series of world expos, the Brussels World Fair (Expo 58) in Belgium, which was the first major world fair to take place after the Second World War, opened on 17 April 1958. Just as the Eiffel Tower was a symbolic structure marking the dawn of the iron industry of its time, the Atomium in Brussels was also built as a symbolic structure representing the atomic research of the era (Şahin, 2023). This is because the Brussels Expo, under the slogan “Technology in the service of humanity. Progress for humanity through technological advancement” was designed by André Waterkeyn as a symbolic architectural structure to mark the dawn of the atomic age (Gantner, 2019).

The Atomium at Brussels Expo 58 is an architectural structure comprising a total of nine steel spheres clad in aluminium, each with a diameter of 18 metres, connected by 3-metre-long tunnels and representing an 186-million-fold magnification of an atomic structure (Şahin, 2023). The spheres are 1.20 cm thick. Laminated aluminium sheets made from Peraluman 15 alloy, capable of producing a reflective mirror effect, were used.

A52-grade steel, capable of withstanding high loads, was used in the structure. This is equivalent to the S355 JR steel used today and has a yield strength of 355 N/mm<sup>2</sup>. Other structural elements were made from A36-grade steel. The total dead weight of the Atomium structure is 2,500 tonnes. It has a hexagonal layout, with a height of 102.704 metres from ground level to the top of the uppermost sphere. There are staircases between the spheres and a lift connecting the spheres in the central section (Nys, 2020).

The spheres of the Atomium are designated by the symbols I for the lower spheres, M for the upper spheres, and B, C and S for the lower, middle and upper spheres respectively. Except for the M spheres, all are divided into levels (Nys, 2020). The spheres in the Atomium's architectural structure, built for Expo 58, were dedicated to the countries conducting research in the field of atomic science. These spheres were used to showcase the results of research in the field of atomic science carried out by the United States, the Soviet Union, the United Kingdom, France, the Federal Republic of Germany and Norway (Şahin, 2023). Figure 1 shows images of the Atomium architectural structure.



**Figure 1:** Brussels Atomium  
**Source:** Taken by Author

It is evident that the architecture of the Atomium possesses a futuristic image that was striking both for the conditions of the era in which it was built and from the perspective of the present day. The emerging construction technologies and new material possibilities of the era played a significant role in shaping this futuristic character. Following the Industrial Revolution, the large-scale use of industrial materials such as steel, concrete and glass in architecture gave rise to intuitive and experimental approaches (Rychkov & Lushnikova, 2017). Consequently, the Atomium's unconventional geometric and structural form can also be seen because of the evolving relationship between industrial production and architectural design.

Furthermore, alongside its architectural imagery as a symbol of the structural acrobatics of the Brussels Expo, it also features dramatic imagery reflecting the technological concerns of the era, the Cold War and global threats (Deriu, 2025). This is because, in the aftermath of the Second World War, fears surrounding the atomic bomb and nuclear armament fuelled universal tensions. Despite these tensions, the search for imagery symbolising technological progress and the future continued (Wallis De Vries, 2012). The second half of 1950 marked a post-war period characterised by socio-economic and geographical challenges. This period brought with it unrest, as well as international conflict and competition. In particular, the implementation of commercial and institutional architectural structures that defied gravity began to increase after 1950 (Deriu, 2025). In this context, the Atomium's form which reinterprets the atomic structure on an architectural scale brings together the era's desire for scientific progress and the social tensions created by the nuclear age within a single architectural image. Atomic geometry, on the one hand, represents the hopes for the future embodied in new technologies and scientific progress. It also bears the cultural traces of the uncertainties and threats

created by the nuclear age. Thus, the Atomium possesses an image that makes the technological capabilities of its era visible through its architectural form.

Renovation work was carried out in 2006. It is known that prior to this work, the average annual visitor count was 250,000, whilst following the work, it rose to 500,000 (Wallis De Vries, 2012). As cultural heritage sites have become commodified assets for tourism, architectural structures have come to symbolise both the nation and the city (Jansen-Verbeke et al., 2005). Today, the Brussels Atomium has been commercialised in the marketing of architectural and cultural heritage (Jansen-Verbeke et al., 2005). This transformation is also evident in the ways in which the Atomium is used. Whilst preserving its historical identity, the structure has become a spatial platform open to contemporary culture and exhibition activities. Exhibitions, temporary events, museum functions and spaces rented out for various purposes are increasing the diversity of the building's uses. The architectural form, which once represented the future, is now transforming into a spatial framework where the future is experienced.

In 1958, following collaborations on design, engineering and materials entirely funded by the Belgian steel industry the construction of the Atomium was financially supported by the Belgian steel industry (Attas et al., 2011). Furthermore, structures built for exhibition purposes also support the creation of public culture as a symbol of the working-class and middle-class industrial workforce (Smits & Jansen, 2012).

## METHODOLOGY

This research employs a hybrid methodology based on a qualitative research approach, with the aim of examining the light, sound and image-based exhibition experience within the interior spaces of the Brussels Atomium. Selecting a model for the research methodology using metaphorical imagery for the Brussels Atomium may prove fruitful for the thesis and antithesis (Cardol et al. 2025). In this context, the research aims to reveal the relationship between the Atomium's futuristic architectural character and the spatial design of the current light show.

As seen in the previous section, trade fairs, as one type of exhibition venue, are important events for showcasing innovation. The Brussels Expo 1958 complex was conceived as a futuristic vision of the future. Even today, humanity's quest for innovation and its visions of the future have led to the reorganisation of this historic structure. A space can offer an experiential glimpse of the future through diverse sensory perceptions. In this context, it has previously been demonstrated that Space Syntax analysis can be used in museum spaces, as exhibition venues, to explain the relationship between spatial organisation and visitor experience (Li et al., 2020). A space is a creation that forms meaningful wholes. For this creation, fragments reflected through human experiences and abstract relationships become integrated into the space. The shaping of the units and abstract reflections within this integration is the Space Syntax technique (Gündoğdu, 2014). In this context, the research will examine the spatial arrangement of the interior spaces where the Atomium's light show takes place, using the Space Syntax method.

Form refers to identifiable expressions of shapes and styles in a physical appearance. The visual perceptions of the future image and the lighting within the interior space have been observed on site and are subsequently analysed using sample visual documentation. The intensity, colour, direction, movement, rhythm, contrast and visual focal points created by the light within the space will be evaluated. In this context, the research model developed within the framework of qualitative research is shown in Figure 2.

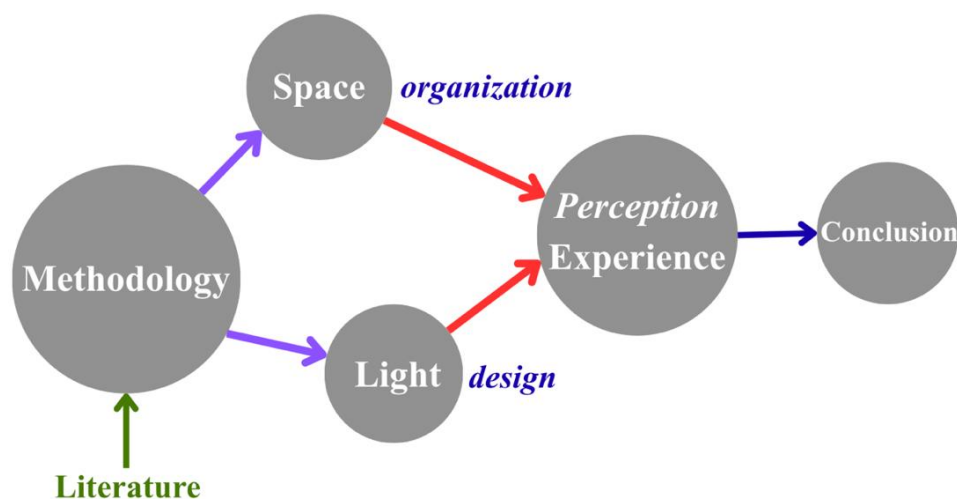


Figure 2: Research Model

In this context, the research aims to explain how the image of a futuristic future represented by the Atomium in 1958 is recreated today through light, sound and visual technologies. Thus, the relationship between the Atomium's historical architectural form and contemporary experiential exhibition design is examined from an interdisciplinary perspective, based on a hybrid research model.

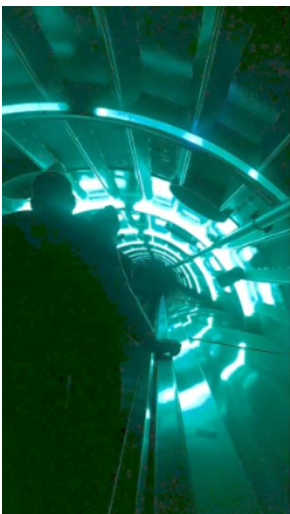
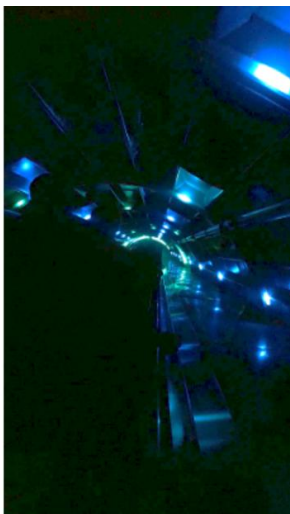
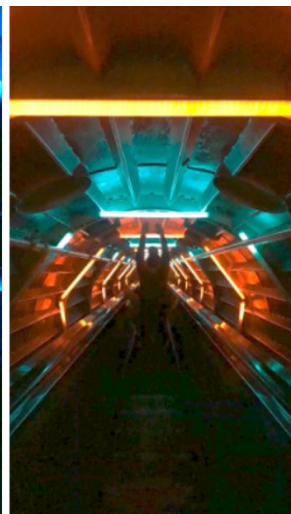
## FINDINGS

In accordance with the research model developed in this chapter, the spatial experience of the light show taking place inside one of the Atomium spheres and the interaction of future imagery are analysed. Taking advantage of on-site observation, this structure was initially examined in terms of its surroundings, architectural volume and interior spatial experiences. Throughout this examination, photographs were taken of the Atomium's exterior and interior elements. In particular, the light show within the interior was recorded on video; subsequently, the visual images extracted from the video were analysed using qualitative indicators within the framework of Space Syntax. The formal characteristics of the lighting designs within the visual arrangement of the space are defined.

Visitors first enter the Atomium via the sphere at ground level. Access to the sphere is via an escalator wide enough for a single person. The central area at ground level within this sphere displays photographs, drawings and various related documents from the construction phase. Access to the next level within the sphere is provided by a single metal staircase. The materials combine architectural and engineering disciplines, prioritising function over aesthetics (Rychkov & Lushnikova, 2017). In this context, access to the other sphere is provided via an escalator in the tubular tunnels, emphasising functionality. The dark tunnel is transformed into a functional and entertaining experience through light displays. The details of the steel supports, the connections and the technological convenience provided by the moving walkway create a dynamic visual effect.

The lights flash in a manner that is both colourful and synchronised with the music. Consequently, the industrial tunnel aesthetic creates a dynamic visual experience through the rhythmic repetition of the lighting and the linear and regional distribution of coloured light. As passive observers standing on the moving walkway, individuals pass through this dynamic visual and auditory experience. In contemporary architecture, the relationship between material and form shapes the user experience and the conceptualisation of structural function. Furthermore, through conceptual approaches, the perception of this form becomes even more interactive (Rychkov & Lushnikova, 2017). It has thus been observed that the connection between the past and the future provides an experience through futuristic imagery that triggers the dynamic visual and auditory perception within the tunnel space. In this context, Table 1 illustrates the experience within the tunnel's interior and articulates the formal elements of this experience as reflected in the design.

**Table 1.** Atomium Tunnel Interior Light Show

| Atomium                                                                                                                                                                                          |                                                                                     |                                                                                      |                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Experience with tunnel connections between two spheres                                                                                                                                           |                                                                                     |                                                                                      |                                                                                       |
|                                                                                                               |  |  |  |
| Visual Sources: Taken by Author                                                                                                                                                                  |                                                                                     |                                                                                      |                                                                                       |
| Horizontal, linear, rhythmic repetition, depth, passive engagement, dynamic flow, auditory cueing, varied colour schemes, and blended light distributions featuring both sharp and soft spreads. |                                                                                     |                                                                                      |                                                                                       |

**Source:** Author

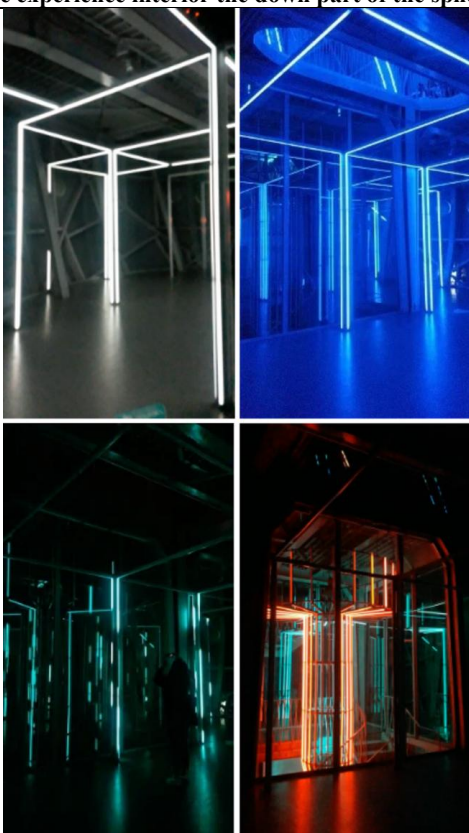
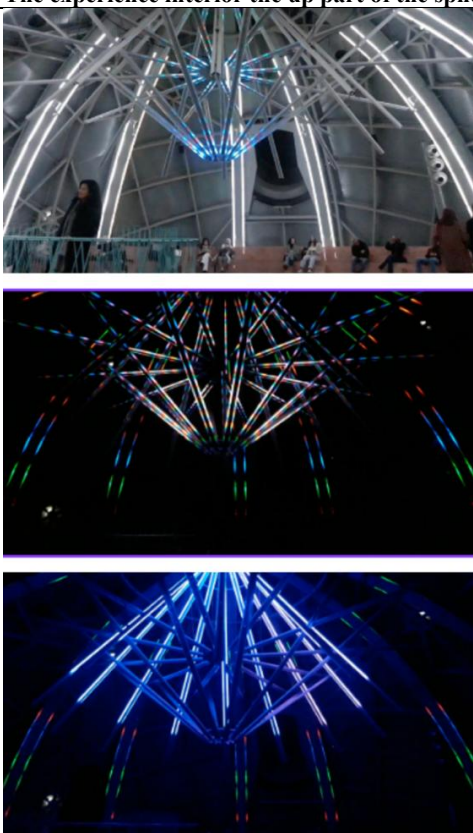
It was observed that when access to the other upper sphere was provided via a tunnel connecting it to the sphere on the ground, the light display continued within the interior of that sphere. Within this sphere, visitors

explore the interior at their own pace. In contemporary exhibitions, visitors have moved beyond being passive observers to become an active part of the experience (Popoli & Derda, 2021). Musical accompaniment continues within the sphere. Horizontal and vertical rods of varying sizes are accentuated by lights. A feast for the senses, synchronised with sound, is explored as visitors move through the space. The concave structures within the sphere's interior create an industrial aesthetic with their flickering lights. The use of the material as a rigid and robust structure creates a contrast with the light within the Atomium sphere's interior. This contrast, with its futuristic harmony, serves as a glimpse into a utopian future. Access to the upper level of the sphere is provided via a single-spine metal staircase.

On the upper floor, the hemisphere of the sphere is perceived more clearly from a structural perspective. The materials used in the architecture synergistically enhance the development of the new design concept (Rychkov & Lushnikova, 2017). This is because the lighting is designed to be compatible with and parallel to the concave hemispherical structure. A detail formed by regular rhythmic repetitions, suspended along the contract axis, is visible within this harmony. This detail is illuminated along the lines of the linear rods. A visual and auditory spectacle is staged in synchronisation with the musical rhythms present on the lower floor. Seating elements, comprising horizontal wooden profiles that conform to the circular plan, have been installed along the edges of the sphere's interior. In this context, Table 2 illustrates the experience within the lower and upper interior spaces of the sphere and articulates the formal elements of this experience as reflected in the design.

Access from this sphere to the other is provided via a metal staircase within the tunnel. The interior of this sphere features the same seating elements. The symbolic and aesthetic functions of furniture design can have a positive impact on user psychology (Özel & Ürük, 2021). Consequently, it seems that seating elements can be designed to harmonise with the symbolic reflections that shape the space. The unit-based graphical arrangements of the structure can have a spatially guiding effect (Yavuz Öden & Çulha, 2026). In this context, an isohypse effect has been created through the repetition of linear circles. This effect has been brought to life through lighting and blended with sound effects. Figure 3 shows the lighting details created using visual elements within the sphere's interior.

**Table 2:** Light Show Interior the Spheres of the Atomium

| Atomium                                                                                                                                                                                                      |                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| The experience interior the down part of the sphere                                                                                                                                                          | The experience interior the up part of the sphere                                    |
|                                                                                                                           |  |
| Visual Sources: Taken by Author                                                                                                                                                                              |                                                                                      |
| Horizontal, vertical, concave, linear, rhythmic repetition, depth, active and passive participation, dynamic flow, auditory cueing, various colour schemes, blended light displays with sharp beam patterns. |                                                                                      |

Source: Author



**Figure 3:** Interior Lighting Show Design  
**Source:** Taken by Author

According to the research model developed using photographs taken from on-site observations and video recordings, the interior of the Atomium offers an experience of futuristics. Just as the Atomium was constructed in the 1950s and 1950s as a symbolic structure representing the atomic age, it can be seen today that it continues to rationalise an abstract future through different sensory perceptions.

## CONCLUSION

This study examines the relationship between light, perception and the image of the future in the interior design of the Atomium in Brussels. The Atomium is a futuristic architectural structure built in 1958 to symbolise the future. Although only six months remained before the Expo was due to close, it was not dismantled due to its architectural splendour and has retained its futuristic identity to this day. Today, it continues to uphold this identity through various exhibitions and experiential designs, serving a wide range of functions. The structure's spherical geometry, its framework and its striking architectural silhouette are seen to offer a unique spatial experience for light, visual and auditory installations within the building, which functions as a museum.

The Space Syntax approach used in this study, that is, spatial syntax, has defined the framework governing visitor movement and experience within the Atomium's interior. It is evident that the connections, transitions, depths and visual relationships between spaces are decisive factors in shaping the exhibition experience. This finding serves as evidence that the light show is not an application independent of the architectural space. When assessed from the perspective of lighting design, elements such as colour, intensity, movement, rhythm and contrast alter the way the space is perceived. The simultaneous use of light with sound and imagery, meanwhile, elevates the experience beyond a mere visual display, transforming it into a multi-sensory exhibition experience.

The conclusion drawn from the findings of the analysis of the Atomium, based on the research model, is that there is a continuity between its historical futuristic identity and the contemporary digital exhibition experience. The architectural form, which in 1958 represented the atomic age through scientific development and technological progress, is today reinterpreted within the interior space through light, sound and visual technologies. Thus, the architectural image that once represented the future has now become a spatial construct in which the future is experienced. In this context, the research demonstrates that the image of the future is not merely a formal or visual representation. The perception of the future can be generated through an experience created by the interplay of spatial arrangement, light, sound, imagery, movement and visitor interaction. In the case of the Atomium, whilst the architectural form provides the physical foundation for this experience, the lighting and audiovisual design re-create this form in temporal and sensory terms.

This research is limited to the light, sound and visual-based exhibition experience taking place within the interior spaces of the Atomium in Brussels. The study does not address all the architectural and historical

features of the structure in detail; rather, it focuses specifically on the spatial layout, lighting design and sensory experience of the interior spaces where the light experience takes place. The design of the interior space has been assessed in general terms through a Space Syntax analysis. However, this method alone is not sufficient to explain the visitor's subjective experience. Furthermore, as this study was conducted through on-site observation and qualitative analysis, it may fall short in terms of objective findings. New design models could be developed not only for the preservation of architectural heritage but also for the reproduction and experience of the vision of the future from the past through contemporary technologies.

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