

ACCESSIBILITY OF MUSEUM FACILITIES FOR OLDER ADULTS IN THE CONTEXT OF CONTEMPORARY ARCHITECTURAL SOLUTIONS: A CASE STUDY OF 3 MUSEUMS IN CAIRO

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HIGHLIGHTS

- Architectural solutions in museums emphasize visitor comfort.
- Seniors are perceived as active participants in cultural life.
- Museums identify older adults as a strategic audience group.
- The aging of society strengthens the importance of consumers of services.

ABSTRACT

Background: Contemporary societies are aging rapidly, which influences the design of public spaces, including museums. The growing number of older people among cultural audiences necessitates taking their needs and limitations into account when shaping architecture and organizing exhibitions. Key factors in the transformations observed in these facilities include the clarity of the visitor route, the quality of lighting, acoustics. **Material and Methods:** The study is comparative in nature and concerns the development of museum architecture in Cairo, with particular emphasis on architectural, technological, and functional solutions adapted to the needs of older adults. The analysis includes 3 prestigious museums – the Egyptian Museum, the National Museum of Egyptian Civilization, and the Grand Egyptian Museum – presenting unique archaeological collections. The research method considers spatial analysis with a focus on visitors aged >60 years, whose number is increasing. **Results:** For older visitors, solutions that support intuitive orientation and reduce cognitive fatigue are essential. Clear signage, logical spatial organization, and the possibility of choosing individual routes are of key importance. It is also crucial to design circulation paths to eliminate feelings of chaos and disorientation. The analysis also considers factors such as confusion, information overload, and anxiety in crowded spaces. **Conclusions:** Contemporary museums are becoming inclusive spaces that respond to the needs of diverse audiences, including older adults. This group is likely to represent the future of many institutions, including museums, as their primary visitors. Therefore, architectural solutions are not only innovative forms but also comfort-oriented approaches aimed at creating welcoming environments. Enhancing visitor comfort by reducing fatigue and using diverse means of communication may encourage engagement with museums and their collections. This is linked both to the development of technologies supporting ambitious architectural projects and to the creation of comfortable environments for the increasingly significant group of seniors, influencing museum design directions and the development of cultural tourism. *Med Pr Work Health Saf.* 2026;77(4)

Key words: architecture, ageing of the population, museums, exhibitions, accessibility, universal design

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INTRODUCTION

Modern societies are aging at a rapid pace, which influences the way public spaces, including museums, are designed. The growing number of elderly people among cultural audiences forces the consideration of their needs and limitations in shaping architecture and exhibition organization. The study is comparative in nature and concerns 3 museums in Cairo presenting archaeological collections:

the Egyptian Museum in Cairo (EMC), the National Museum of Egyptian Civilization (NMEC), and the Grand Egyptian Museum (GEM). Architectural, technological, and functional solutions were analyzed in the context of the needs of the elderly. The applied method is based on the evaluation of space according to technical, spatial, and cognitive criteria, with the inclusion of seniors.

The conducted analysis shows the evolution of museums – from traditional exhibition institutions

to modern, multifunctional cultural spaces. Key factors in the changes that have taken place in these facilities include the clarity of the tour route, lighting quality, acoustics, and the method of spatial narrative. The most advanced solutions were applied in the GEM, which provides high comfort in orientation and perception of the exhibition. The article refers to the analysis of selected museum facilities in terms of a specific group of users – people aged >60 years. For older people, intuitive spatial organization, clear signage, and the possibility of an individual choice of tour route are particularly important. Proper design of communication routes allows for the limitation of disorientation, information overload, and cognitive fatigue. The research results show that modern museums function as inclusive spaces adapted to different user groups. The development of technology favors a growing group of recipients by improving touring comfort and thus increasing the attractiveness of museums in cultural tourism.

MATERIAL AND METHODS

The research was conducted using the case study method [1,2]. It concerns 3 museum facilities in Cairo, Egypt, built at different periods. The analyzed objects are the EMC, NMEC, and the GEM, which represent architectural styles, formal solutions, and approaches to creating exhibitions and their relationship with the recipient characteristic of their time of creation. The study is comparative and focuses on observing the development of museum architecture with particular emphasis on architectural, technological, and functional solutions in design regarding the needs of the elderly.

The choice of the analyzed objects stems from their shared location – Cairo – and the fact that all were created to present archaeological collections that are unique on a global scale. Their prestigious character was also significant, both at the stage of organizing design competitions and during implementation, which influenced their rank in the city context and their importance for designers. The development of the architecture of museum facilities is a process in which not only the approach to architectural form changes, but also the way of building the relationship between the exhibition and the recipient [3]. Contemporary architectural objects are no longer just places for presenting collections – they have also become an essential element of urban exhibition space [4]. Consequently, spectacular museum buildings are playing an increasingly important role in the cultural tourism market, attracting visitors not only for the collections presented but also as attractive objects in themselves.

The applied research method is based on the observation and analysis of spatial solutions according to functional criteria typical for museum facilities, such as technical, spatial, and cognitive aspects. These criteria refer to buildings visited by diverse groups of recipients differing in origin, touring style, interests, and age. Particular attention was paid to the elderly, who – due to health limitations, including mobility, cognitive, or emotional dysfunctions – require appropriately adapted conditions in public spaces, which include museums. Currently, tourists aged >60 years are gaining increasing importance among museum visitors. This is related to the noticeable aging of societies; data indicates that in 2020, the number of people aged ≥60 years surpassed the number of children <5 years old. With the progressive increase in the number of seniors in society, they are a clearly visible group of recipients for various services, including tourism [5]. According to World Health Organization data, the share of people >60 years in the world's population will nearly double 2015–2050 – from 12% to 22% [6].

However, this group is internally diverse in terms of health, expectations, and financial means. At the same time, the availability of free time and the shaping of an individual lifestyle are gaining importance, making chronological age lose its significance [7]. The tourism industry increasingly recognizes the potential of this group, characterized by specific preferences, time availability, and relative financial stability. Seniors actively participate in the market economy, develop their interests, and use offers corresponding to a modern lifestyle [8]. Simultaneously, it is observed that tourism for people aged >60 years is moving away from a model of trips aimed only at improving health toward an innovative and more complex concept of well-being. This is noticeable in offers proposing to fulfill certain wishes of older tourists demanding the right to “normal” experiences that they consider “non-ghettoizing,” even if they require special preparations [9].

Considering the >60 age group as potential recipients of museum exhibitions, it is necessary to adapt facilities to their needs resulting from, among others, physical and mental conditions [10]. The conducted comparative analysis of Cairo museums aims to show how the way of designing museum buildings has shaped over time and how the approach to the comfort of the senior viewer's stay in the museum has changed.

RESULTS

Changes in architecture over the centuries involve not only aesthetic aspects but primarily formal and functional

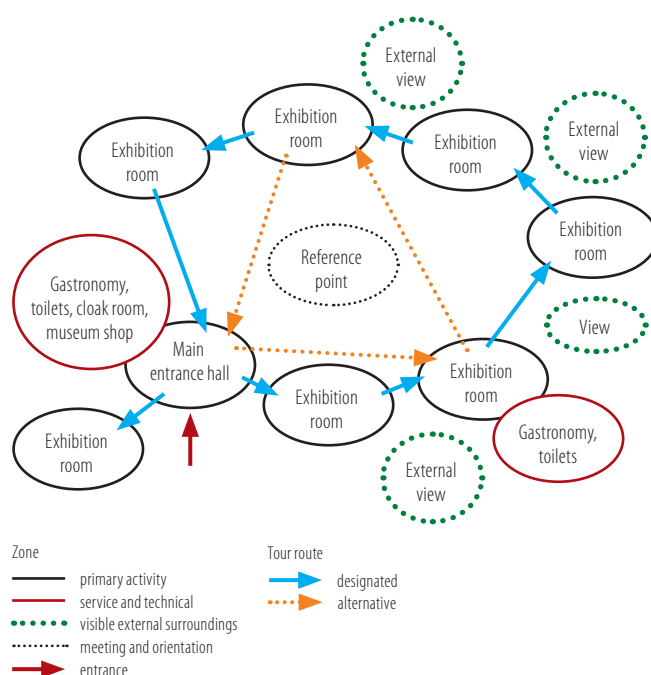
transformations. In the case of museum facilities, this development has reached a particularly advanced level, resulting in buildings with unique forms that constitute an essential element in shaping the city's image. The location of a building in the city structure, and thus its accessibility and impact on the surroundings, currently have a significant influence on building the identity of a place [11].

Regardless of formal differences, museum projects contain common components that enable the shaping of exhibition space and influence the touring comfort of all users. However, the analysis of these solutions in relation to people aged >60 years takes on particular importance, as their needs arise from health limitations, such as musculoskeletal disorders, cognitive and neurological problems, or sensory organ dysfunctions. The response to these conditions should be reflected in the spatial design of museums, especially in shaping a clear and ergonomic touring path. It is important that moving around the facility does not cause excessive fatigue, boredom, or a sense of disorientation. In this context, it becomes key to introduce resting places, such as seating areas, as well as visual openings (e.g., windows) enabling contact with the external environment, which favors both physical and perceptual regeneration.

Due to difficulties related to orientation in space, it is also advisable to design clear landmarks visible from various parts of the facility. Figure 1 presents a diagram of a possible optimal museum space solution eliminating negative effects on the older recipient. The functional complement to the tour route should be catering points, such as cafes and restaurants, which allow for rest, as well as easily accessible sanitary nodes.

Parallel to the development of architectural forms, there is a noticeable development of technologies supporting the reception of the exhibition. Lighting – both natural and artificial – is of particular importance, as it significantly affects the perception of space and exhibits [12]. Appropriate lighting eliminates both excessive contrasts and insufficient illumination, ensuring the legibility of descriptions and the comfort of reception, which is particularly important for people with visual impairments. The quality of the visit is also shaped by environmental parameters, such as air temperature and humidity. They are important not only for the protection of exhibits but also for the well-being of users, especially the elderly, for whom stable and appropriately selected microclimatic conditions are particularly significant.

To discuss the transformation of museum architecture over the years, the following provides a description of the time of construction, style, and circumstances



The concept takes into account the reduction of visitor fatigue along the exhibition route through the use of view openings in the exhibition halls, the placement of supplementary functions, such as catering areas and toilets, directly accessible from the exhibition spaces, as well as the possibility of choosing the visiting route.

Figure 1. Conceptual layout of an optimally designed museum space

of selecting the architectural concept, as well as the size, function, and scale of the exhibition for each museum. The oldest is the EMC, which was opened to visitors in 1902. It is a typical example of a public building from the turn of the 19th and 20th centuries designed in the Neoclassical style (Figure 2). The building plan is compact and symmetrical, with a two-story opening in the central exhibition hall.

Two floors are accessible to visitors, the second of which is open with the possibility of observing the ground floor level. The final idea for the museum's form was selected through an international architectural competition (1893–1895), in which 87 projects were submitted. The winner was the French architect Marcel Dourgnon, working with German architect Hermann Grabe. The facility was located on Tahrir Square in the center of Cairo, emphasizing its representative character and importance in the urban structure of the city at that time. The museum's exhibition area is 15 000 m², and the collection at the time of opening consisted of approx. 170 000 exhibits [13].

The second facility dedicated to exhibiting archaeological collections is the NMEC. The facility was opened in 2021 and represents a contemporary approach to museum architecture, described as postmodern. It is not just a museum facility, but one possessing lecture halls,



Photo: Dorota Wojtowicz-Jankowska

The sculptures arranged within the large hall emphasize the axial layout of the interior, while the lack of designated resting areas leads visitors to sit on the stairs and other available surfaces.

Figure 2. Main exhibition hall of the Egyptian Museum in Cairo with a symmetrical spatial arrangement, Cairo, Egypt, 2024

workshops, and meeting places. The plan of the facility is a fragmented block with a clearly emphasized entrance and direction of touring (Figure 3).

The axial layout facilitates touring and provides a sense of security. Simultaneously, elements such as a skylight in the central part of the hall and the descent via a ramp to the exhibition part below the ground level constitute highly characteristic forms identifying this place. The building design was developed by Egyptian architect El-Ghazali Kaseiba based on a direct investor commission [14]. On the other hand, the interior design and the exhibition narrative concept were selected through an international competition (in 1884), many years before the building's opening. Architects Arata Isozaki from Japan and Jean-Michel Wilmotte from France are responsible for the interior design and exhibition arrangement. The museum is located in the Old Cairo district, near Lake Ain El-Sira. The building's area, with many functions beyond just museum use, is 130 000–140 000 m²,



Photo: Dorota Wojtowicz-Jankowska

The significance of the space is emphasized by the symmetrical interior layout, the skylight in the ceiling, and the pillars incorporating the elevator shafts.

Figure 3. Main hall of the National Museum of Egyptian Civilization and entrances to the Royal Mummies Galleries, Cairo, Egypt, 2024

while the main exhibition covers 2000 m². The total area of the architectural complex is 490 000 m². At the time of opening, 50 000 exhibits were shown [15].

The newest Cairo museum is the GEM, the grand opening of which took place in 2024. It represents one of the largest contemporary museum investments in the world. The architecture of the facility is minimalist (Figure 4). The building, with a compact form, stands on a representative square.

The entrance hall is a vast space from which it is possible to enter the exhibition and the retail-catering area. The building's location and the layout of the museum's various functions utilized the natural difference in ground height (50 m). During the journey through the museum, the visitor has a sense of discovering subsequent parts of the exhibition without feeling lost. The project was selected in 2003 through an international competition, to which 1556 works from 82 countries were submitted. The competition was won by the Irish firm Heneghan Peng Architects. The museum is located in Giza, in the immediate vicinity of the pyr-



Photo: Dorota Wojtowicz-Jankowska
Seating areas have also been designed in the exhibition hall, next to the exhibits.

Figure 4. Interior of the Grand Egyptian Museum with alternative visitor circulation routes via moving walkway and stairs, Cairo, Egypt, 2024

amid complex. The building area is approx. 480 000 m², making it one of the largest archaeological museums in the world. At the time of opening, about 100 000 exhibits were made available [16].

A comparison of these 3 objects indicates a clear change in the scale and method of designing museums. While the EMC represents a classic museum model with a compact structure and limited exhibition area, later realizations are characterized by a much larger scale, an extensive functional program, and a modern approach to presenting cultural heritage. Specifically, the GEM serves as an example of a contemporary museum as a cultural complex, integrating exhibition, educational, and tourist functions. Simultaneously, a limitation in the number of exhibits is visible despite the increase in building area.

Architectural solutions of Cairo museums

Considering the elderly, i.e., those >60 years old, as museum users, one must consider architectural solutions that promote their comfort. Elements that decide this include the compositional layout of the facility, which favors an intuitive way of moving through it. Devel-

oping the tour route is intended on one hand to guide the recipient through the entire museum, but also to give them the chance to individually create their tour path [17,18]. This can be achieved through distributed information points with maps and understandable signage. It is also essential to design movement paths (corridors, stairs, ramps, elevators) to eliminate the sense of being overwhelmed, chaos, or confusion [19]. Simultaneously, safety resulting from the interior finishing materials used, such as non-slip floors and stable stair handrails, is a key element increasing touring comfort [20].

The analysis shows that considering health-related aspects of visitors in museum architectural solutions only began to play a significant role in the cases of NMEC and GEM (Table 1). This is manifested in the conscious design of places for rest and limiting exhibition fatigue. The size of the facility itself is not an obstacle to creating a visitor-friendly place by introducing modern solutions, such as the moving walkway in the GEM. Furthermore, various types of seating (chairs, benches) distributed in exhibition halls and catering spaces along the route favor energy regeneration while enabling contact with the outside through window views, enhancing the quality of the experience. Locating functions like toilets directly on the tour route increases the sense of security, especially among the elderly.

The EMC, however, was designed primarily as a space for presenting exhibits. Visitor comfort, including that of the elderly, was not a determining factor for the design solutions adopted. Contemporarily applied solutions facilitate movement for the elderly, but they are not original architectural elements, as such needs were not considered.

Spatial solutions of Cairo museums

In museum facility projects, beyond formal or functional assumptions, it is necessary to consider cognitive experiences, both positive and negative [21]. For older people, disorientation related to an unclear tour route organization can occur. Improperly designed exhibit counts and arrangements can lead to deconcentration, cognitive fatigue, and even anxiety. This stems from information overload delivered through various means, such as moving images and sound, affecting the sensory reception of the exhibition space. Table 2 compares selected elements of museum space organization that affect perceptual comfort and orientation [22].

In all 3 museums, spatial orientation was effectively solved through clear functional layouts and distinct landmarks [23–25]. However, significant differences ap-

Table 1. A comparative analysis of spatial and architectural design solutions addressing the physical and psychological limitations of older adults – the case of the Egyptian Museum in Cairo (EMC), the National Museum of Egyptian Civilization (NMEC), and the Grand Egyptian Museum (GEM) in Cairo, Egypt, 2024

Criterion	EMC	NMEC	GEM
Plan, internal communication, and number of floors	– entrance leads upstairs; modern platform added for wheelchair access* – vertical communication provided by symmetrically placed staircases (2 floors high) – corridors and passages are wide, favoring free movement	– entrance through a square with a slight slope toward the museum – internal communication primarily on flat surfaces between rooms – descent to the underground exhibition via ramp or elevator, forming part of the axial layout – building has 3 floors, including 1 underground, served by elevators and stairs	– entrance from square level to the main hall – touring begins with a moving ramp, though stairs are also an option – communication between levels via stairs, ramps, and elevators adapted to varied heights
Resting places	– lack of dedicated seating in exhibition spaces – visitors sit on exhibit pedestals	– seating primarily in visitor service zones (entrance hall, cafes, shop area)	– seating distributed at various points along the route, e.g., near exhibits and at viewpoints (e.g., toward Giza pyramids)
Solutions limiting exhibition fatigue	– spatial layout lacks visual contact with surroundings (no eye-level windows) – marks on floors from removed collections negatively affect reception	– varied presentation (cases, free-standing, multimedia) and links to recreation (e.g., cafe with lake view) maintain interest	– varied presentation (cases, sculptures, multimedia) – catering, shops, and route choice maintain high interest levels
Toilets	– located on ground and mezzanine levels; modern partial adaptation for elderly/disabled*	– designed for comfort, considering elderly and those with limited mobility	– high standard of use, adapted for those with limited mobility

* Elements added in modern times.



Photo: Dorota Wojtowicz-Jankowska

Figure 5. Entrance hall of the Grand Egyptian Museum with the granite statue of pharaoh Rameses II as a spatial landmark, Cairo, Egypt, 2024

pear regarding concentration and the elimination of cognitive fatigue (Figure 5). In the EMC, the lack of a designated route and excessive simultaneous exhibits lead to perceptual overload. These problems were largely eliminated in newer facilities through ordered narrative, clear directions, and individual path options. Anxiety levels have also improved, being reduced in NMEC and GEM thanks to larger spaces and better organization.

Technical solutions of Cairo museums

Technological solutions significantly influence the quality of the museum stay and exhibit reception [26,27]. Table 3 presents how technological progress has improved exhibit presentation and facilitated the visiting process, including for the elderly.

Analysis indicates that the quality of spatial reception is largely determined by the consistency of lighting, acoustics, and spatial narrative. Facilities with clear routes (NMEC and GEM) and designed lighting/acoustics provide higher comfort. In the EMC, symmetry helps orientation, but the lack of an ordered route causes concentration difficulties. The NMEC features clear organization and an axial layout with orientation elements like balconies or skylights. The GEM employs the most complex solutions, with a dominant hall and a clear spatial hierarchy.

Table 2. Assessment of spatial design strategies for mitigating cognitive and psychological difficulties among older adults – a comparative study of the Egyptian Museum in Cairo (EMC), the National Museum of Egyptian Civilization (NMEC), and the Grand Egyptian Museum (GEM) in Cairo, Egypt, 2024

Criterion	EMC	NMEC	GEM
Disorientation	not present – a symmetrical plan with a central entrance/hall – ground and first floors visible from the hall, aiding orientation	not present – axial tour route despite the non-symmetrical building plan – skylight and granite elevator shafts serve as landmarks – functional layout largely visible to visitors	not present – entrance hall is the dominant landmark – main route with moving walkway visible from ground floor – the monumental pharaoh statue is a central landmark
Loss of concentration	present – no designated tour route – lack of clear direction signage – hard-to-read exhibit descriptions	not present – designated tour route – exhibits arranged in an understandable layout – individual route options	not present – clearly designated tour route – exhibition creates a narrative – main exhibit (the Rameses statue) focuses attention in the hall
Cognitive fatigue	present – large number of exhibits visible simultaneously from many points	not present – ordered exhibition layout – varied tour route	not present – varied spatial forms (scale, height, lighting, outside views)
Anxiety	possible – chaotic organization – high density of visitors in small areas	unlikely – large areas in upper halls – underground hall might feel overwhelming	not present – very spacious museum with ample room to observe exhibits

Table 3. Assessment of technical design solutions supporting the sensory experience of older adults in museum environments – a comparative study of the Egyptian Museum in Cairo (EMC), the National Museum of Egyptian Civilization (NMEC), and the Grand Egyptian Museum (GEM) in Cairo, Egypt, 2024

Criterion	EMC	NMEC	GEM
Lighting	– natural light aided by artificial light – insufficient intensity in some areas (e.g., for labels)	– natural light supplemented by artificial – varied intensity helps presentation	– balanced natural and artificial system – high perceptual comfort and legibility
Acoustics	– materials do not provide adequate isolation (voices and footsteps audible)	– varied volume and materials limit sound spread and maintain relative quiet	– high comfort; no echo/reverberation – sound supports some exhibition parts
Visibility	– good visibility of main exhibits – overall exhibition composition is unclear	– clear spatial layout and route – exhibit placement favors proper perception	– very high visibility – exhibits appropriately displayed in space
Information and narrative	– information system and narrative need improvement – route is unclear to visitors	– consistent narrative – logical and understandable presentation	– descriptions are clear, visible, and well-integrated
Thermal comfort and ventilation	– interior is slightly cooler but high temperatures can affect long stays	– climate control provides stable conditions for people and collections	– climate control and hall design allows partial natural circulation – ventilation/air conditioning in smaller spaces

DISCUSSION

The comparison of these 3 museums presenting spectacular archaeological collections is not just a discussion of architectural solutions in historical development. It is also a discussion of how designer awareness, shaped by user needs, is changing. With societal changes, specifically the global increase in the >60 population, the adaptation of exhibition places to their needs is no-

ticeable. Drawing solutions from airports (the moving walkway in the GEM) is not just a functional innovation but a chance to create a new form of perception. Wandering between large sculptures can be tiring; perceiving them “in motion” allows for saving energy for smaller exhibits. This is like urban design where large distances are covered by car and short ones on foot to notice city details [28]. Egyptian museum architecture >100 years reflects changes in the approach to cultural heritage

presentation, investment scale, and the role of the visitor-guest. Both their needs and limitations are considered in projects. These 3 museums represent 3 stages of development: from a collection-focused institution (EMC) to a multifunctional cultural space (NMEC), and finally a cultural complex integrated with the landscape (GEM).

CONCLUSIONS

Modern museums are no longer just institutions for collecting and preserving exhibits. They now serve as spaces integrating diverse social groups in terms of age and culture. While the exhibition is the same for everyone, perception is individual, based on cognitive abilities and preferences. The analysis of the 3 Cairo museums indicates a shift toward larger scales but fewer exhibits to improve quality and reception. Visiting is becoming a sequential spatial experience offering sensory impressions. Limiting boredom through audiovisual stimuli is becoming a key design aspect. These solutions especially benefit the elderly while increasing museum attractiveness for everyone. Technology, resting places, and clear organization are now standards. Adapting space for the elderly is no longer just a formal requirement but an essential part of being an inclusive institution. The “silver generation” is a significant group of recipients, and meeting their needs is a major direction for cultural tourism development. The Cairo examples show how architectural forms and new technologies transform museum space and its reception.

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