Enhancing the disabled inclusivity at the Opera of the new administrative capital of Egypt

Islam Saqr
Interior Architect
Islam.Sakr@gaf.ac

Engy A. Gabal,
Teacher Assistant at the School of Creative Arts, IAD Department –
GAF,
e.fathy@gaf.edu.eg

Eman Ahmed Elsayed Mahmoud Alakaby
Assistant Professor/ Module leader at The Interior Architecture and
Design program, school of Creative Arts, The University of
Hertfordshire, Egypt GAF, Egypt
e.akaby@gaf.edu.eg
Assistant Professor at Decor Department, Faculty of Fine Arts,
Alexandria University, Egypt
eman.a.akaby@alexu.edu.eg

Abstract:
This research examines strategies to enhance the inclusivity of individuals with mobility impairments at the Opera House in Egypt's New Administrative Capital. As a cultural and architectural landmark, the opera house is positioned to set a benchmark for accessibility in public spaces. The study examines current accessibility features, identifies gaps in meeting international standards such as those outlined by the Americans with Disabilities Act (ADA), and explores innovative design solutions tailored to the needs of people with mobility challenges. Using a mixed-methods approach, including site analysis, and case studies of inclusive opera houses worldwide, the research proposes actionable recommendations for architectural modifications, technology integration, and policy enhancements. Key areas of focus include the design of

wheelchair-accessible seating, ramps, elevators, parking facilities, and wayfinding systems. Additionally, the study emphasizes the importance of inclusive programming and staff training to create a welcoming environment for all attendees.

The findings aim to contribute to broader discussions on urban accessibility in Egypt and advocate for the integration of inclusivity as a core principle in the development of cultural institutions. Ultimately, this research underscores the role of the arts in fostering societal equity and participation for individuals with mobility impairments.

Keywords:

Inclusive; Mobility Impairments; Opera House; Equality.

Introduction

Disabled individuals often face challenges that undermine their sense of equality, such as navigating streets, accessing public transportation, and enjoying cultural experiences without barriers. Historically, Egypt's infrastructure has neglected disability rights, but recent years have seen progress toward inclusion. The new administrative capital presents an opportunity to create a fully inclusive opera house that caters to individuals with mobility impairments, blending artistic, social, and advanced urban design. Prioritizing inclusive and sustainable design *(Fig 1)* ensures environments are accessible, adaptable, and considerate of social and economic needs, creating spaces that are user-friendly for all *(Fig 2)* and beneficial to the planet in the long term.

Fig 1 Sustainability Diagram Via Oknation,
Economic sustainability focuses on the efficient and responsible use of resources.
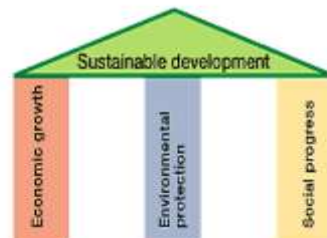

Fig 2 The three pillars of sustainable development

Project Objectives

The project aims to enhance accessibility for individuals with physical disabilities, ensuring everyone can fully enjoy spaces regardless of ability. It emphasizes sustainable design using durable, eco-friendly materials and energy-saving technologies to create lasting, adaptable solutions. Additionally, the project seeks to raise awareness about the importance of inclusivity and foster collaboration among various groups. Implementing these initiatives aims to make the opera house in Egypt's New Administrative Capital more welcoming and improve the quality of life for many.

Sustainable Development Goals

SDG 9: Industry, Innovation, and Infrastructure lays great emphasis on building resilient infrastructures and innovating in the same while encouraging sustainable industrialization.
SDG 10: This goal aims at reducing inequalities within and among countries for access to opportunities and services for all.
SDG 11: The focus of this goal is to make cities and human settlements inclusive, safe, resilient, and sustainable *(Fig 3)*.

Fig 3 SDGs, Via Sdgs.un.org,
Established by the United Nations in 2015 as part of the 2030 Agenda for
Sustainable Development.

2030's Vision

An **integrated and sustainable environmental system** means creating and taking care of places like parks, buildings, or neighborhoods in a way that helps people, animals, and plants. It's about making sure that everyone has what they need to be healthy and safe, no matter who they are or where they come from. **Social justice and equity** mean making sure that everyone gets a fair chance to succeed and has access to the same resources and rights. **In Egypt's quality of life**, it's really important to help people live better lives and to make sure their homes and communities are good places to live so that the country can keep growing and doing well *(Fig 4)*.

Fig 4 2030's Goals, Via
mped.gov.eg,
Launched in February 2016.

Literature Review
The Difference between Universal, Inclusive Design and Accessibility

Universal Design relates to creating products and environments that are usable by everyone, from the beginning on, regardless of ability-ramp, lever door handles, etc. It is about integration and usability without adaptation (Woodward.S, 2020). **Inclusive design**, on the other hand, lends itself to flexibility and diversity-user needs, usually working with a user in the design effort towards customizing or tailoring interventions, like multilingual interfaces, adjustable desks, and so forth (Clarkson.J & Coleman, 2010). **Accessibility** is the component concerned with the particular needs of people with disabilities for tearing down barriers-typically for cases through targeted accommodations like screen reading software, closed captions, or braille signage. All three focus on making things user-friendly, but while accessibility refers to disability, inclusive design carries the metaphor of acceptance, and universal design pursues solutions that work for all (Klahn.J, 2010).

Mobility Impairments Definition

Mobility impairments refer to difficulties with movement, balance, or coordination, which can make tasks such as walking, climbing stairs, or maintaining stability challenging. These limitations often affect a person's well-being and sense of community belonging by hindering their ability to perform daily activities or navigate spaces. Assistive devices like wheelchairs and walkers are commonly used to enhance mobility. The global prevalence of mobility impairments is rising due to aging populations, chronic health issues, and higher survival rates from accidents. Addressing these challenges and providing support is vital for promoting inclusive and supportive communities (Brown, C. J., & Flood, K. L. 2013).

Causes of Mobility Impairments

Mobility impairments can arise from various causes, including congenital conditions like spina bifida and cerebral palsy, which affect movement and muscle control from birth. Chronic illnesses such as arthritis, diabetes, and heart disease can also make mobility difficult over time. Injuries and trauma, including spinal damage, broken bones, or head injuries from accidents, can severely limit movement. Additionally, aging naturally weakens muscles, reduces joint flexibility, and decreases bone density, further impairing mobility (Brown, C. J., & Flood, K. L. 2013).

Impacts of Mobility Impairments

Mobility impairments can have a considerable impact on one's quality of life, independence, and ability to engage in social participation. Barriers such as difficulty in using public transportation, accessing buildings, education, and employment are huge challenges that most people with mobility impairments go through leading to social isolation and even poverty (Guralnik, J., Ferrucci, L., Balfour, J., et al. 2001).

The Opera History The opera was born in Italy about 400 years ago during the Renaissance era; the most main purpose of this probably has been to resurrect the storytelling through music in the style of the Ancient Greek drama. Most operatic historians tend to credit the first opera in history to Jacopo Peri for composing Dafne (*Fig 5*) in 1597, while they regard Claudio Monteverdi's Orfeo, which premiered in 1607, as the first great opera. Opera passed through the Baroque, Classical, and Romantic phases, and in the latter, it became differentiated into various styles, such as opera seria and opera buffa. Great contributions to the developments made by Wolfgang Amadeus Mozart and Giuseppe Verdi were made alongside operas like The Marriage of Figaro and La Traviata as reputable staples in the repertoire. By the end of the 19th century, composers such as Richard Wagner revolutionized opera with newer harmonic tricks and

Fig 5 – Dafne Via Wiki
***Dafne* is the earliest known work that, by modern standard**

abstractions from narrative scope (Brandt, A., Christensen, C.L., & Nielsen, L.S., 2018).

Inclusive Design in Opera House

The inclusion of mobility impairment features in operating design is to give all possible opportunities for his/her enjoyment. Some case studies are here to illustrate how opera companies implemented inclusive designs meeting such conditions (Edwards, G., Kiss, J., Morales, E. 2019).

1. **Accessible Seating and Viewing Areas**:

Many opera houses have made strides in the more thoughtful provision of accessible seating. For instance, the Metropolitan Opera House in New York City has provided wheelchair accessible seating

sections where wheelchair-bound patrons can enjoy performances unobtrusively (Edwards, G., Kiss, J., Morales, E. 2019).

2. **Improved Access:**

Various modifications have been made to the Royal Opera House in London to make the venue more accessible for the mobility-impaired patrons. Access ramps, elevators & automated doors form easy access into the entire venue for the patrons. The Royal Opera House also conducts guided tours specifically for disabled persons so that they may experience the space without worrying about how to move (Edwards, G., Kiss, J., Morales, E. 2019).

Sustainable Environment at Opera House

Most opera houses have moved towards green practices since the reduction of carbon footprints and emotionally sensitive awareness. For instance, Teatro alla Scala, Milan reduced carbon emissions by more than 630 tons from 2010 through lines such as converting to LED lighting and digitizing operations. Similarly, the Sydney Opera House turned out an ambitious Environmental Sustainability Plan that has produced an impressive result in terms of energy savings and amount of waste recycling, carbon-neutral three years ago. The improvement, thus, makes the operations of such cultural institutions more efficient and proves to be very much the way to go for the young generation regarding sustainability while making the traditional exhibiting form adaptable to the present environmental issues.

Carbon-Footprint Factor in Opera Interior Architecture

Architecture is central to climate change, given its great share of carbon emissions. The carbon footprint for the building covers the entire life cycle of the structure from manufacturing to construction at the site, operation, and demolition. This paper, therefore, looks at these emissions as important factors in achieving global sustainability targets (Budajova, J. 2021). Carbon footprint means the total amount of greenhouse gases, which includes carbon dioxide, So_2, No_2,O_3. etc.) produced by the activities of interior users. On a global scale, carbon dioxide emissions must be kept less than 2 tons a year by 2050. Reducing the carbon footprint of an individual from 16 to 2 tons does not in one night, this requires a great task to prevent house gas emissions (Elakaby.E, 2023). In order to significantly reduce the carbon footprint, it is essential to prioritize the use of sustainable materials, such as recycled, renewable, or biodegradable resources, which help minimize environmental impact and promote long-term ecological balance as the following:

Sustainable Materials

1. Aectual", a Dutch company, demonstrated during the grey-to-green change how 3D-printed bioplastics could be used to make several sustainable and customizable flooring *(Fig 6)* solutions to "build resilient future space". Patterns by Company is a terrazzo floor that integrates a 3D-printed pattern with a bio-based terrazzo infill. A wide range of patterns and designs are offered by the designer. This will give storytelling to the job. The designers will be delighted by the consultations in advance with the client and then upload the digital sketch or use the already existing company.

Fig 6 – Aectual Flooring
Via Aectual.com
Work with recycled waste-streams
and plant-based materials,
creating no waste in the process

2.MOROSO was established in 1952 and is an iconic furniture manufacturing company. They stand committed to the craftsmanship way of innovation and an impulsive touch of creativity in the design phase. Hence, Moroso. presents to the world its first natural fibre mono chair designed by Werner Aisslinger built using a totally new technology under the name Werner Islinger's "Hemp Chair". It has been produced from natural fibers such as hemp are thermoformed using a special eco-friendly adhesive developed in cooperation with BASF. (Tang, F. 2014). Turning Acrodur into a new natural and sustainable composite material *(Fig 7)*. Another more complicated way he designs and builds a chair is by making it from thin layers of material that comprise a complete structure.

Fig 7 – MOROSO Products -
Via MOROSO.it
It was the brainchild of
Agostino Moroso

This one has soft curves, with ring structures horizontally and vertically-is a new way to approach this complex typology of seating (Budajova, J. 2021).

Technological Innovation

Theatres have always faced some sort of challenge in making their facilities accessible to people with physical disabilities due to various structural and logistical barriers. However, technology is changing this and is making these spaces inclusive for all users. From mobility-friendly architectural designs to digital tools that make it easier to navigate and stay comfortable, theatres are increasingly using innovative technology to break down barriers and provide equal opportunities for physically disabled people (Budajova, J. 2021)

Applying Studies at The Opera House

Smooth Navigation: Wheelchair users will find the flooring easy to walk around on because it is **non-slip, smooth, and devoid of thresholds, you** can find your way to the auditorium using the **intelligent navigation lighting** on the floor. The ride to your seat level is smooth thanks to the roomy elevators, spoken announcements, and tactile buttons.

Wayfinding: You are greeted with an intelligent **digital kiosk**. In addition to having an easy-to-use menu with options for text enlargement, audio descriptions, and sign language interpretations, the screen can be adjusted to your height. Whether it's the main hall, restroom, or ticket desk, you can choose your location with ease.

Design Principles

When making lobbies that are open for individuals with disabilities, it is significant to take after the orders set up by the Americans with Incapacities Act (ADA) Measures for Available Plan. These benchmarks lay out particular measurements and criteria to ensure that halls are available to everybody, counting people with portability challenges (ADA, 1990). The slightest clear width for the section of one wheelchair (Fig 8) must be 32 inches (815 mm) at any point for a most extreme expansion of 24 inches and 36 inches (915 mm) reliably.

Maximum Depth of Doorway (Fig 9) : The minimum clear width, measured from one side wall to the face of the other side wall, is 32 inches (815 mm). The opening's maximum depth is 24 inches (810 mm) (ADA, 1990).

Make room on the floor (Fig 10) :30 inches by 48 inches (1220 mm) (760 mm).

Take a Forward Approach. The wheelchair is 30 inches (760 mm) wide by 48 inches (1220 mm) deep, and it is oriented toward a wall, object, or surface (Fig 11) (ADA, 1990).
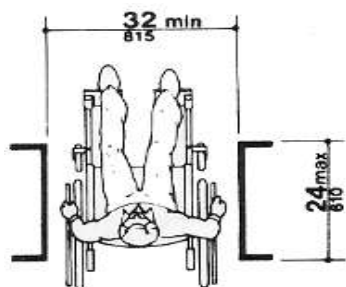
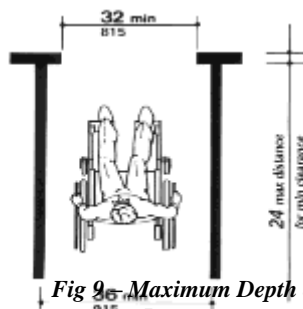*Fig 8 – Clear width for the section of one wheelchair*
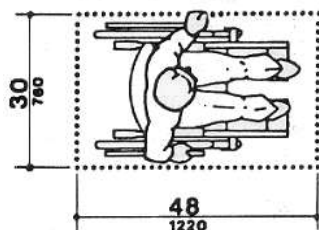

Fig 9 – Maximum Depth of Doorway
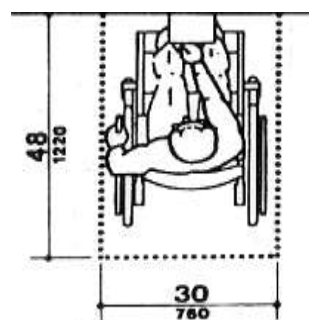

Fig 10– Wheelchair Floor

Fig 11 – The Wheelchair oriented through wall

Similar Projects
Lobby Case Studies

To further extend the frontiers of inclusivity into **The Sydney Opera House**, it had to adopt modern technology. These include:

Mobile Accessibility Applications: The development of a special mobile application for real-time navigation assistance for people with disabilities. Indoor mapping through voice-guided, wheelchair-user-specific directional assistance should enable users to navigate the complex layout of the Opera House stress-free.

Theatre Case Studies

In addition to extensive physical upgrades, the Sydney Opera House has integrated state-of-the-art technology to significantly enhance accessibility for all patrons. This comprehensive approach, combining innovative design and advanced technological solutions, highlights the institution's commitment to fostering inclusivity and creating an environment that is welcoming to diverse audiences

Mobile Accessibility App: A dedicated mobile app was introduced as part of the accessibility initiative. This app offers: Indoor Mapping: Interactive maps guide users through the complex layout of the Opera House, identifying wheelchair-friendly routes, elevators, and restrooms. Audio Guidance: For visually impaired users, the app provides step-by-step audio instructions to navigate the space confidently (Thom, P., 2011).

Personalized Accessibility Settings: By asking users about their mobility requirements, the app can customize its recommendations and draw attention to pertinent features like reserved parking or accessible seating.

Backstage Case Studies

Through technical and physical remodeling, the Royal Shakespeare Company (RSC) provides a noteworthy illustration of inclusion. The Swan Theatre had a significant renovation in 2016 with a focus on wheelchair accessibility backstage. Wide hallways, accessible dressing rooms, and an elevator system that could accommodate both normal and electric wheelchairs were also features of the upgrades. Mat Fraser, a well-known actor and disability rights activist, was able to fully participate in performances because of these modifications. Fraser has discussed how having easy access to theater locations freed him from logistical concerns so he could concentrate on his skills (Thom, P., 2011).

Manuscript Case Studies

Establishing an Inclusive Museum Culture

Thiis study explores how museums can foster inclusive environments that cater to diverse groups, including children, Millennials, and Generation Z. It emphasizes the importance of casual, meaningful interactions and the strategic use of observation to better understand and enhance visitor experiences. By adopting this approach, museums not only become more accessible and approachable but also create deeper personal connections with visitors, ensuring a more engaging and inclusive cultural experience.

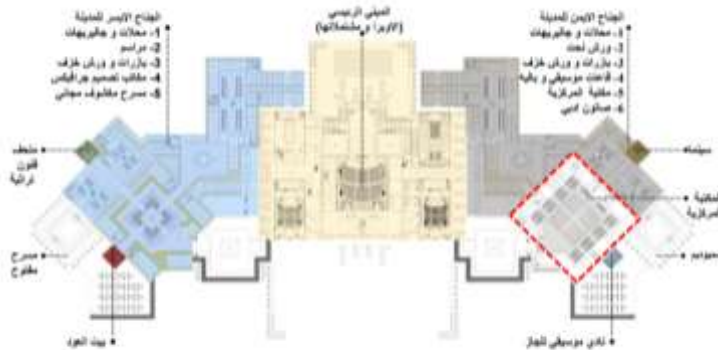## Analytical Study, The Opera House in The New Administrative Capital of Egypt

The New Administrative Capital of Egypt *(Fig 12)*, a visionary project, aims to redefine the country's urban landscape. Located roughly 45 kilometers east of Cairo, this ambitious development is set to house key government institutions, modern residential areas, and advanced infrastructure, all contributing to the country's future growth. Among the most exciting features of this new city is the Opera House, a stunning cultural center that is expected to become one of the most significant landmarks in Egypt's modern history (ECGSA, 2021).

The Opera House in the New Administrative Capital is part of Egypt's broader initiative to create a city that is not only a political and economic hub but also a cultural and artistic center. The government has emphasized the importance of cultivating arts and culture to complement the country's heritage. As such, the Opera House is being designed to meet international standards, serving as a space for world-class performances, exhibitions, and cultural exchanges (Ahram Online, 2021).

The design of the Opera House in the New Administrative Capital combines modernity with elements of Egypt's ancient history. The building's architecture is a fusion of contemporary styles and traditional Egyptian motifs, ensuring that the structure stands out as an emblem of

Fig 12 – NAD via Dar Al Handasah Initiated by the Egyptian government

the nation's unique identity. The Opera House features an imposing façade with large glass windows that allow natural light to flood the interiors, creating a vibrant and open atmosphere (Orascom Construction, 2021). Inside, the venue will boast a variety of spaces, including a grand auditorium with seating for thousands of visitors, as well as smaller, more intimate spaces for chamber music and theatre performances. The auditorium will be equipped with cutting-edge acoustics, ensuring that sound quality is unparalleled. The stage will be able to accommodate large-scale productions, including operas, ballets, and symphonic concerts, while the lobby area will be designed to host exhibitions, events, and cultural festivals.

Fig 13 – The Opera House Plan in The New Administrative
Capita of Egypt Via ECG
*The Biggest theatre can receive 2,500 users*

Designing an inclusive theatre for the New Administrative Capital Opera *(Fig 13)* requires a comprehensive approach that integrates accessibility, cultural representation, and advanced technology into a cohesive and functional architectural plan. The design must adhere to universal design principles to ensure the space is accessible to everyone, including individuals with physical, sensory, and cognitive disabilities. Key architectural features should include step-free access at all entry points, ramps and elevators strategically placed for convenience, and wide doorways to accommodate wheelchairs. Seating arrangements must incorporate flexible and inclusive options, such as wheelchair spaces spread across various sections of the auditorium to offer equitable sightlines, along with companion seating.

Backstage areas, including dressing rooms, green rooms, and technical spaces, should be designed for accessibility to allow performers and crew members with disabilities to participate fully in productions. Advanced technologies, such as assistive listening devices, hearing loops, and real-time captioning systems, should be integrated into the theater to enhance the experience for individuals with hearing impairments, while smart navigation tools like audio guidance and braille signs should assist visually impaired patrons. Sustainable and eco-friendly construction methods, including energy-efficient lighting and locally sourced materials, should align the project with global green building standards.

Site Analysis
Site Context

About 45 kilometers east of Cairo, Egypt's New Administrative Capital (NAC) is a carefully planned metropolitan development *(Fig 14)*. The NAC is becoming a smart city and a national center for innovation and governance, with the goal of reducing Cairo's urban congestion and promoting economic growth. Between 2016 and 2017,

changes in land cover and the expansion of the NAC have been intensively examined using remote sensing technologies. These studies reveal the site's rapid transformation and the value of the post-classification technique in analyzing urban expansion (Saber et al., 2021).
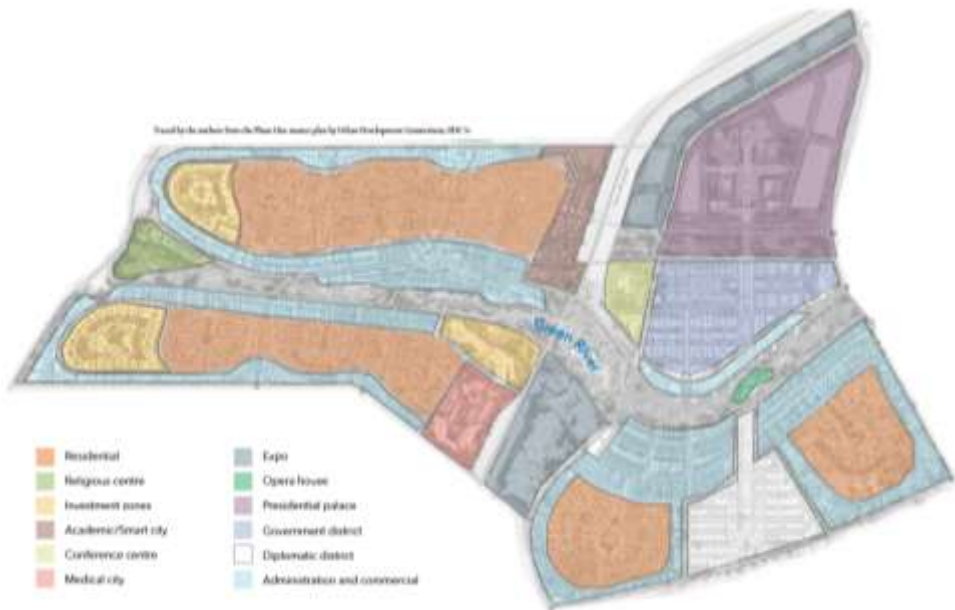

Fig 14 – The New Administrative Capital of Egypt Plan Via Dar Al Handasah.
The Iconic Tower, the highest tower in Africa.

In order to facilitate organized development and reduce traffic, the NAC's urban design integrates a thorough zoning system that divides residential, commercial, administrative, and recreational zones. Egypt's ambitions to establish itself as a regional and international center are reflected in architectural masterpieces like, located in the Central Business District

(CBD). High-rise structures, glass facades, and energy-efficient technologies are examples of modern design elements seen in the tower and the adjacent commercial sector.

Conclusion

Improving accessibility for people with mobility impairments at the opera is not only a strategic and cultural opportunity but also a moral and legal requirement. Opera houses can encourage a more diverse audience and uphold their status as organizations that honor universal human expression by making their buildings more accessible through inclusive programming, technological advancements, and architectural changes. In addition to the obvious advantages of higher attendance and income, these programs demonstrate the opera's dedication to social justice and unity, guaranteeing that the art form will continue to be accessible and relevant in a contemporary, inclusive society. This strategy emphasizes the importance of cultural venues that accept everyone, enhancing the group experience and advancing the more general objective of equality in the arts.
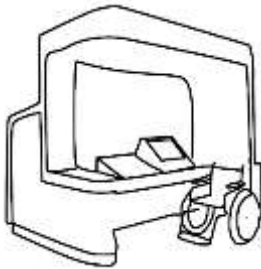
Fig 15 – Tickets Counters
This sketch is enhanced using Photoshop

Fig 16 – Modular and Adjustable Chairs with sensors
This sketch is enhanced using Photoshop

Adaptive Features: Seats have assistive devices, such tactile surfaces or headphone jacks for audio explanations, while adjustable seating platforms give users with varying accessibility demands flexibility. Designing an opera chair that is inclusive *(Fig 15 & Fig 16),* adjustable, and smart requires thoughtful

Fig 17 – Adjustable chairs (This sketch is enhanced using Photoshop)

integration of ergonomic design, accessibility features, and advanced technology to enhance the experience for users with mobility impairments. The chair should offer adjustable height, seat depth, and backrest inclination, allowing users to tailor the seating to their individual comfort needs. Armrests should be removable or capable of being raised or lowered to facilitate easy transfers from wheelchairs or mobility aids. The seat base can include a swivel mechanism to assist users in adjusting their position *(Fig 17)* without requiring excessive movement. Upholstery materials should be durable, non-slip, and cushioned to ensure both comfort and safety. These seating options include adaptable arrangements that accommodate a range of requirements *(Fig 18)*, including those of wheelchair users, people with restricted mobility, and people who need companion seating. Instead of relegating accessible seating to remote locations.
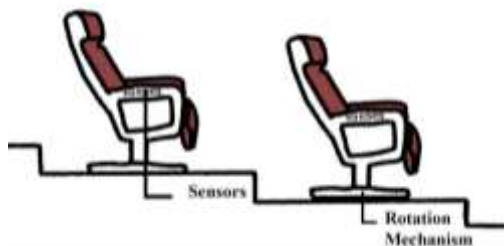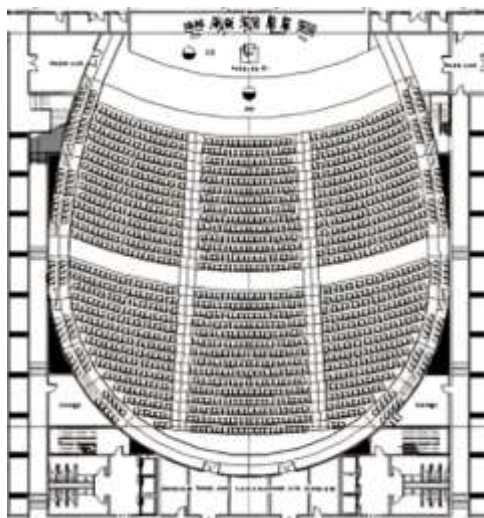

Fig 18 – Seating options include adaptable arrangements

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تعزيز شمولية المعاقين في الوصول إلى الأوبرا بالعاصمة الإدارية الجديدة

إسلام صقر

مهندس معماري داخلي

Islam.Sakr@gaf.ac

إنجي علاء جبل

مساعد مدرس في كلية الفنون

الإبداعية، قسم التصميم الداخلي

والتصميم الجرافيكي GAF

e.fathy@gaf.edu.eg

د. إيمان أحمد السيد محمود العقبي

أستاذ مساعد/ قائد وحدة التصميم

الداخلي والعمارة كلية الفنون الإبداعية

هيرتفوردشاير، مصر

أستاذ مساعد في كلية الفنون الجميلة،

قسم الديكور- جامعة الإسكندرية، مصر

eman.a.akaby@alexu.edu.eg

e.akaby@gaf.edu.eg

الملخص:

يتناول هذا البحث الاستراتيجيات المختلفة التي تهدف إلى تعزيز شمولية الأفراد ذوي الإعاقات الحركية في دار الأوبرا بالعاصمة الإدارية الجديدة في مصر، والتي تُعد معلمًا ثقافيًا ومعماريًا بارزًا. وباعتبارها رمزًا حضاريًا، تمتلك دار الأوبرا فرصة استثنائية لتكون نموذجًا رائدًا في تطبيق معايير إمكانية الوصول للأماكن العامة. تسعى الدراسة إلى تحليل شامل للميزات الحالية لإمكانية الوصول، مع التركيز على تحديد الثغرات التي تعيق الامتثال للمعايير الدولية، مثل تلك التي يحددها قانون الأمريكيين ذوي الإعاقة.(ADA) كما تستعرض الدراسة مجموعة

من حلول التصميم المبتكرة التي تأخذ في الاعتبار احتياجات الأفراد ذوي التحديات الحركية، وذلك من خلال منهجية متعددة الأساليب تجمع بين تحليل الموقع ودراسة أمثلة ناجحة من دور أوبرا شاملة على مستوى العالم. ومن أبرز التوصيات المقدمة تحسين البنية التحتية عبر تصميم مقاعد مخصصة للكراسي المتحركة، وتطوير منحدرات ومصاعد ملائمة، وتعزيز أنظمة تحديد المسارات ومرافق إلى جانب الجوانب الهندسية، تشدد الدراسة على أهمية تضمين البرمجة الشاملة وتوفير تدريب لضمان بيئة تتسم بالترحيب وتلبية احتياجات جميع الزوار، بما يعكس التزام دار الأوبرا بالمساواة والشمولية الثقافية.

الكلمات المفتاحية:

الشمولية؛ الإعاقات الحركية؛ دار الأوبرا؛ المساواة