



DESIGN THINKING FOR MALL ARCHITECTURE BETWEEN SUSTAINABILITY TECHNIQUES AND LOCAL IDENTITY IN EGYPT

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ABSTRACT

This study presents a research perspective of the harmonious achievement of sustainability and local identity in egyptian malls. It examines influence of sustainable techniques on local identity vocabulary in architectural design for malls. This includes form developments, environmental relationships, design philosophy, and the method of gathering users and activities in the mall. The study reveals how these factors contribute to the emergence of a new architectural design thinking characterized by "abstract identity". This evolving role has introduced new models for interactive malls that meet the requirements of the twenty-first century while preserving their local identity. Therefore, this paper explores how sustainability techniques and local identity aspects affect the development of design thought for malls, aiming to finally devise a systematic strategy for designing future malls that aligns with environmental requirements and preserves local identity

KEYWORDS: Malls ; Architectural Design Thought ; Sustainable Techniques ; Local Identity ; Abstract Identity

التفكير التصميمي لعمارة مراكز التسوق: بين تقنيات الاستدامة والهوية المحلية في مصر

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المخلص

تقدم هذه الدراسة منظورًا بحثيًا لتحقيق التوازن بين الاستدامة والهوية المحلية في المولات التجارية المصرية. وتتناول تأثير التقنيات المستدامة على مفردات الهوية المحلية في التصميم المعماري للمولات، بما يشمل تطور الشكل، والعلاقات البيئية، وفلسفة التصميم، وطريقة تجميع المستخدمين والأنشطة داخل المول. وتظهر الدراسة كيف تسهم هذه العوامل في ظهور نمط جديد من التفكير المعماري يُعرف بـ "الهوية المجردة". وقد أدى هذا الدور المتطور إلى ظهور نماذج

جديدة لمولات تجارية تفاعلية تواكب متطلبات القرن الحادي والعشرين مع الحفاظ على هويتها المحلية. ومن ثم تستكشف هذه الورقة كيف تؤثر تقنيات الاستدامة وعناصر الهوية المحلية على تطور الفكر التصميمي للمولات، بهدف استنباط استراتيجيات منهجية لتصميم مولات المستقبل تتماشى مع المتطلبات البيئية وتحافظ على الهوية المحلية.

الكلمات المفتاحية : المولات التجارية ، الفكر التصميمي المعماري ، تقنيات الاستدامة ، الهوية المحلية ، الهوية المجردة.

1. INTRODUCTION

Since their inception, malls have been crucial points of a city's appeal and serve as distinctive markers of local character and culture. They shape visitors' mental image of the city. Sustainable design practices can place the city prominently on the commercial map while reinforcing its local identity. But how can sustainability aspects be met without sacrificing these areas' distinctive local identity?

Existing research has not adequately addressed this challenge. Although preserving a city's heritage and cultural characteristics is a key aspect in some of sustainability assessment systems, such as the Qatar Sustainability Assessment System (QSAS) [1], practical examples of effectively balancing these priorities in malls are limited and the literature lacks systematic approaches for evaluating the interplay between sustainability and local identity, leaving a significant gap in both theory and practice. This study investigates how sustainable techniques can be harmonized with local identity in the urban design of commercial streets through a comparative analysis aiming to approach a systematic strategy _a design form_ for future malls or renovated ones.

2. METHODOLOGY

To finally devise a systematic strategy for design thinking of malls, the methodology depends on comparative analysis through a relative and approximate evaluation checklist from a theoretical study to categorize the mall sustainability techniques and another checklist to assess aspects of mall local identity. A consolidated evaluation matrix is created to identify available opportunities and capabilities, assessing the success of the design thought for malls as a whole, based on sustainability and identity. As expressed in **Fig. 1**, the research methodology has five sequences:



Fig. 1: Methodology sequences. Reference: Researcher

3. THEORETICAL STUDY (PREVIOUS STUDIES)

3.1. Evaluation check list for sustainable techniques categories in malls

3.1.1. The Role of Sustainable Techniques in Formulating Design Thinking for Malls

There is no universally agreed definition of sustainability; rather, there are various perspectives on the concept and how its techniques can be applied [2]. "Sustainable" refers to something that can be maintained over time, while "techniques" are methods used to ensure that something can continue efficiently at a certain level. These techniques aim to achieve economic, social, and cultural sustainability goals, contributing to be environmentally friendly [2].

Numerous green building rating systems provide frameworks to help and foster competition among sustainable buildings. The following table **Table 1** presents a comparative analysis of five green building rating systems: LEED, BREEAM, GSAS, Estidama, and the Green Pyramid.

Table 1: Presents collective categories of the rating systems [3- 9]

Rating systems / Categories	LEED	BREEAM	GSAS	Estidama	Green Pyramid
Development Process				Integrated Development Process	
Management	Innovation in Operating	Management	Management & Operations		Management
Sustainable Site	Sustainable Site	Land Ecology	Site	Natural Systems & Livable Spaces	Sustainable Sites
Transportation		Transport		Sustainable Transport	
Energy Efficiency	Energy & Atmosphere	Energy Use	Energy	Resourceful Energy	Energy & Atmosphere
Water Efficiency	Water Efficiency	Water	Water	Precious Water	Water Efficiency
Material Efficiency	Material & Resources	Resources & Resilience	Materials	Stewarding Materials	Material & Resources
Indoor Quality	Indoor Environmental Quality	Health & wellbeing	Indoor & Outdoor Environment	Livable Indoor Spaces	Indoor Environmental Quality
Waste Management		Waste		Waste Management	
Environmental Pollution		Pollution			
Heritage Preservation			Cultural & Economic Value		Social & Cultural Awareness
Innovation	Innovation in Design	Innovation		Innovating Practice	Innovation & Design Process
Urban	Regional Priority	Land Use	Urban Connectivity		

By analyzing the data in the previous table, it can be concluded that:

1. **Common Categories:** All rating systems share five common categories: Sustainable Site, Energy Efficiency, Water Efficiency, Material Efficiency, and Indoor Quality. Which are the core principles of sustainability assessment for commercial malls.
2. **Energy Efficiency:** None of the rating systems specify particular methods for energy conservation, such as smart operating systems, design software, or new energy generation technologies. Instead, they assess overall energy consumption, adapting to technological advancements.
3. **Heritage Preservation:** QSAS and Green Pyramid systems are distinct in their focus on evaluating cultural and social characteristics and preserving identity. These elements are crucial for malls, especially those serving as tourist attractions, as preserving local identity particularly in countries rich in heritage_.
4. **Management:** LEED, BREEAM, QSAS and Green Pyramid assess innovation in management and operating systems. In malls, sustainable Management appears smart lighting systems and automated operating systems.
5. **Transportation:** BREEAM and Estidama are notable for their focus on assessing Transportation which is distinct from assessing the suitable site. In the context of malls, assessing the suitable site requires an analysis that considers the surrounding context and the mall's location within the city. In contrast, the transportation category specifically assesses the availability of transportation options and the convenience of accessing the mall site.
6. **Pollution and Waste Management:** BREEAM and Estidama specifically include Waste Management as a fundamental category. This is also a critical aspect of evaluating the sustainability of malls, where waste can be collected, separated, and prepared for recycling.

7. **Environmental Urban Performance:** LEED, BREEAM, and GSAS focus on assessing the environmental urban performance and land use of the site. This approach can also be adapted for mall buildings by evaluating outdoor coordination and parking areas.

3.1.2. An evaluation checklist of sustainability techniques in malls

Based on the previous deductive analysis for international and national green building rating systems, a categories checklist has been derived to be suitable for the nature of malls' architecture design. These categories have been organized into an evaluation checklist with three colors, as illustrated in **Table 2**. To finally provide a relative and approximate evaluation of the sustainability techniques in each mall, the researcher assumed that; a mall that well-achieve the category can be considered "Totally Completed" and is indicated by a black color on the evaluation checklist. When a mall did not completely-achieve the category or partly implemented or planed but not implemented, it is classified as "Partially Completed", represented by a gray color on the checklist. Malls that didn't achieve and have no plan to achieve the category are deemed "Not Achieved" and are marked with a white color on the evaluation checklist.

Table 2: evaluation check list for sustainable techniques categories in malls

Sustainability Techniques Categories	Evaluation Checklist		
	Totally Achieved	Partially Achieved	Not Achieved
1.Sustainable Site	√		
2.Energy Efficiency		√	
3.Water Efficiency	√		
4.Material Efficiency		√	
5.Indoor Quality		√	
6.Pollution and Waste Management			√
7.Heritage Preservation	√		
8.Management	√		
9.Transportation	√		
10. Outdoor Coordination and Parking	√		

3.2. Evaluation check list for local identity aspects in malls

3.2.1. The Role of Local Identity in Formulating Design Thinking for Malls

The concept of identity encompasses various definitions. Castells defines identity as "people's source of meaning and experience." In contrast, Erikson views identity as shaped by an individual's experiences and tasks throughout the life cycle, influenced by social interactions [10]. Lynch defines identity as "the extent to which a person can recognize or recall a place as being distinct from other places" [11]. Therefore, identity can be understood as requiring uniqueness, involving interaction with people and objects, and being a continuously dynamic phenomenon [10].

Many studies have developed different levels of "identity," including: 1. personal identity, which creates diversity among individuals within a single society, and 2. collective identity, which creates diversity among societies, is characterized by distinguishing the group from others, and serves as a source of pride for the group

In Shao's assessment of local identity, he identifies four subsets: 1) Place Identity/Attachment, 2) Personal Identity, 3) Cultural Identity, and 4) Community Identity [12]. At the local level, architectural design identity/attachment focuses on historical heritage elements, physical interaction, cultural and social activities, and users' feelings of satisfaction. These aspects influence local identity and emphasize how the project architecture integrates with the local area's identity, impacting both visual and conceptual aspects of design identity. Consequently, the project's cultural identity interacts with the visual aspect of personal heritage identity. Together with the personal identity of the project, these factors contribute to forming the "mall identity."

"Abstract Identity": A concept allows architects to use sustainability techniques by adapting identity vocabulary to align with contemporary technology and capabilities. This approach fosters innovative design in terms of form, materials, and vocabulary without relying on explicit replication, representing a high degree of design creativity. it is called adaptive identity [29].

According to Shao [12], there are four main aspects responsible for identity formation: the physical, the social, the sensory, and the memory aspects:

1. **The physical aspect:** This shapes local identity and generally includes the built environment represented by building architecture (e.g., building design and forms, settlement patterns, colors, materials, and structures) and landscape elements (e.g., topography, green infrastructure, landmarks, and waterscapes).
2. **The social activity:** This aspect helps form local identity by building connections between users and the local area. It facilitates the integration of the local place to better meet people's functional needs and makes the site unique through its local activities.
3. **The sensory aspect:** This represents how users physically experience the project, reflected in their perceptions of color, sound, smell, and texture. In terms of identity development, a strong sense of place helps people connect with their environment, attract visitors, and foster pride among inhabitants.
4. **The memory aspect:** This involves the inheritance from the past [13], typically expressed through physical and spiritual heritage, historical sites, and monuments. Ancient buildings allow us to read and understand history and incorporate its lessons into development plans [14].

The interplay between the physical, social, sensory and memory aspects of local identity is shown in Fig. 2

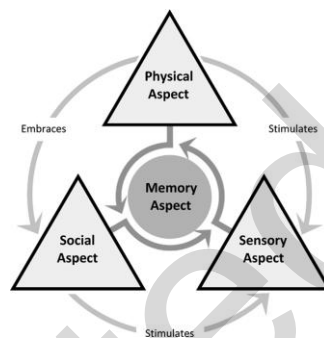


Fig. 2: Conceptual framework of the aspects of local Identity [14]

By analyzing Shao framework of local identity, it can be concluded that the most important aspects of local identity assessment in malls can be:

1. **Commitment to Local Identity Vocabulary:** Local identity vocabulary of the mall can appear in its “physical identity”; Building Form, Building External Shaping, Indoor Environment and Site Coordination (e.g., flooring material, lighting systems, outdoor seating areas, plaza's landscape and parking area). It requires recognizing that each place has its own distinct.
2. **Preserving Heritage:** Heritage preservation is integral to a mall's local identity. However, architectural styles should be updated without altering their proportions and scale. This necessitates continuous enhance in architectural Design Thinking Essence to conserve local area heritage, keeping it relevant to the time, place, users, and surrounding nature, thus improving the design essence of mall identity.
3. **Literal Replication of Heritage Vocabulary:** Literal replication concept is not essential for achieving identity. Instead, adapting and renewing heritage elements to fit contemporary society without literal copying, that's what Shao meant in “The social activity”. This development enhances architectural Design Thinking Philosophy to make design concept better align with its era.
4. **Imitating Nature:** Incorporating elements from the surrounding natural environment into the mall's design is a significant aspect of local identity. This approach can create a distinctive design style that sets the place apart from other local identities and enhances the mall's appeal. This can be expressed as Surrounding Natural Environment Simulation aspect of local identity assessment.
5. **Bonding Identity to the Time Period:** The identity of a commercial street should reflect the era in which it has been formed in and that passes over it, considering the various economic, social, and political conditions that inevitably influence its Era identity.
6. **Sensory Experience:** For commercial malls, “the sensory aspect” _how users physically experience the mall_ is crucial. This includes providing a warm, comfortable atmosphere

associated with recreational activities and cultural celebrations. That means User Identity of the mall is a pivotal aspect of mall local identity that inflect users' tradition and culture.

7. **Mall Trademark:** One of the key features of a mall's identity is its trademark, which set "the memory aspect" of the mall. Additionally, unique mall trademarks enhance the mall's identity and set it a special character apart from others.

3.2.2. An evaluation checklist of Local Identity in malls

Based on the previous deductive analysis, the effectiveness of a mall in achieving local identity aspects can be achieved when it simulates the architecture heritage of its era and integrates with the surrounding environment. An aspects checklist has been derived to be suitable for the nature of malls. These aspects have been organized into an evaluation checklist with three colors, as illustrated in **Table 3**. To finally provide a relative and approximate evaluation of the local identity in each mall, the researcher assumed that a mall that well-achieve the aspect can be considered "Totally Completed" and is indicated by a black color on the evaluation checklist. When a mall did not completely-achieve the aspect or partly implemented or planned but not implemented, it is classified as "Partially Completed", represented by a gray color on the checklist. Malls that didn't achieve and have no plan to achieve the aspect are deemed "Not Achieved" and are marked with a white color on the evaluation checklist.

Table 3: Evaluation checklist for local identity aspects in malls

Local Identity Aspects	Evaluation Checklist		
	Totally Achieved	Partially Achieved	Not Achieved
1. Building Form	√		
2. Building External Shaping		√	
3. Indoor Environment	√		
4. Site Coordination	√		
5. Design Thinking Essence		√	
6. Design Thinking Philosophy			√
7. Era Identity (time & place adaptation)	√		
8. User Identity (culture & tradition).	√		
9. Surrounding Natural Environment	√		
Simulation			
10. Mall Trademark		√	

4. ANALYTICAL STUDY (FOR TWO NATIONAL CASE STUDIES)

4.1. Case studies selection criteria

- 1) The mall has a built mass must function solely as a commercial center to avoid the impact of functional overlap on the architectural design approach.
- 2) The mall must be occupied and operational, not under construction, for accurating evaluation.
- 3) The mall should be a fully integrated commercial center that supports spending a full day, meeting various human needs by combining both shopping and entertainment experiences.
- 4) The samples must be from the same time period and same climatic zone to ensure more accurate assessment of environmental sustainability strategies.

The following is a descriptive analysis of each case study based on library research and, as much as possible, field survey conducted by the researcher. The two case studies are:

1. "Mall of Arabia", 6 October City, Giza government, Egypt.
2. "Mall of Egypt", 6 October City, Giza government, Egypt.

4.2. A descriptive study of the two case studies from the perspective of sustainability categories and the aspects of local identity for each mall individually

4.2.1. Mall of Arabia

Location: 26th axis, 6 October City, Giza, Egypt

Founded: in 2010

Long: 882,000 m²

Mall Description: The second-largest shopping and entertainment center in Egypt, spanning approximately 140 acres. Designed by ECG and built by Orascom and Hassan Allam Sons for the Saudi-owned Marakez company, it marked a significant shift in Egypt's retail scene. It won the ICSC Gold Award for Best Development Program in MENA and a special award for its sustainable community development efforts, **Fig. 3**.



Fig. 3: Mall of Arabia [15]

1. Sustainability criteria

❖ 1. Sustainable Site:

- located at the entrance to 6th October City, which has a desert climate, on a major artery “the 26th of July Axis”.
- The design **takes into account the topography of the land, including slopes**, and focuses on making the most of the natural environment, climate, and open spaces [15].

❖ 2. Energy Efficiency:

- Using **tempered glass panels on the exterior walls** provides natural light while reducing solar radiation and lowering the temperature inside the mall.
- Choosing **an artificial lighting system with lower thermal emissions** helps reduce the thermal load, thereby conserving energy, shown in **Fig. 5**.
- Using **fabric structure tents**, shown in **Fig. 5**, reduces heat permeability and prevents air leakage, allowing for better control of heating and cooling processes and increasing their efficiency [16].
- **Separating thermal zones**, such as fast-food outlets and restaurants, and grouping them within a single area (food court) **to maintain cooling energy**.



Fig. 4: Fabric structure tents [15]



Fig. 5: An atrium covered with a glass skylight dome [15]

- ❖ **3. Water Efficiency: Using Gray Water** for irrigating gardens and green spaces outside the mall.
- ❖ **4. Material Efficiency: Using appropriate building materials**, such as the type and thickness of insulation for walls and ceilings.

❖ **5. Indoor Quality:**

- Using **coated aluminum panels to cover interior walls** and columns to absorb excess heat within the space and store it until the temperature drops, they release the stored heat back into the interior to balance the internal environment.
- Using **polycarbonate panels in skylights** allows natural daylight to enter while insulating against heat and direct solar radiation within the interior spaces, **Fig. 5**.
- **Using fire-resistant materials** for construction and interior finishes in most parts of the building [18].

❖ **6. Pollution and Waste Management:**

- **Using high-efficiency, energy-saving LED lights** with advanced technology that reduces carbon emissions.
- **The mall entirely relies on artificial ventilation systems** with environmentally harmful refrigerant-based air conditioning [19].

❖ **7. Heritage Preservation:**

- The **prominent entrance features arches**, light decorative panels (**banohat**), and simply **ornamented column capitals**, with a **pyramidal structure** covered in tiles crowning the entrances, as shown in **Fig. 6**.
- The architectural design **incorporates tent-like structures** inspired by ancient Egyptian heritage.
- **Glass domes** cover the internal courtyards, reflecting traditional design elements in a modern context [17].

❖ **8. Management:**

- **Photo-Voltaic Technology:** Used in lighting columns in some parking areas to convert solar energy into electrical power.
- **Smart Lighting for Internal Corridors:** The lighting system adjusts according to natural light levels, using light sensors to control appropriate light intensity. **Smart air conditioning systems** with automated control methods are also selected.
- **Smart Control Systems:** Cooling, ventilation, fire systems and all electrical and mechanical systems, are connected to an automated network for building monitoring and control [16].
- **Minimizing Path Lengths and Efficient Network Distribution:** (lighting and air conditioning) to minimize electrical losses.
- **Efficiency improving** transformers and electric motors, balancing loads, **enhancing the power factor** of electrical devices and equipment, and ensuring proper distribution of networks [17].

❖ **9. Transportation:**

- 26th of July Axis is a major artery, where **public transportation at Gate 21 of the mall**. However, it is difficult to walk through the entire mall due to its large, tall, as shown in **Fig. 7**, and transportation is only available at Gate 21.
- There is **no dedicated goods pathway** within the mall.



Fig. 6: A prominent classical mass topped with a pyramidal section covered in terracotta tiles [22]



Fig. 7: Horizontal circulation paths are marked in black & the vertical escalators are highlighted in green.

Reference: modified by the researcher

❖ 10. Outdoor Coordination and Parking:

- It has a **large number of parking spaces** in front of each gate (it has 23 gates) with a total parking area of 680,000 m², **designed according to the technical requirements for parking areas** [19].
- The central courtyard of the mall is enhanced with a **water feature (a dancing fountain area)**, which helps to reduce the thermal load.

2. Local identity

❖ 1. Building Form:

- The building has a **closed linear mass with appropriate orientation (north)** that encloses a large open courtyard featuring a dancing fountain, **providing privacy and a sense of enclosure**, as shown in Fig. 8.
- The **fabric structure tent** is a strong visual identity vocabulary [18].
- The roofs of the internal courtyards are made of skylight glass in **the shape of a glass dome**, allowing natural daylight to blend with artificial lighting [17].

❖ 2. Building External Shaping:

- The facades are characterized by **simplicity and elegance**, as shown in Fig. 9.
- **The entrances feature with protruding masses** from a simple classical design, with light arches, beige panels, and columns and cornices with a straightforward profile. Some entrances are topped with a raised pyramidal section covered with tiles.



Fig. 8: closed linear mass with large open courtyard [15]



Fig. 9: Façades are painted in a light brown color with an orange tint [15]

❖ 3. Indoor Environment:

- **Using a modern design style** in shop facades, corridors, and the interior furnishings.
- Subdued lighting in the corridors, combined with natural daylight, **creates a local identity with a sense of enclosure** [16].

- ❖ **4. Site Coordination:** Using large green elements in the plazas in front of the entrances and extensively in the central courtyard **around the dancing fountain**, with various types of local trees and flowers, creates a sense of tranquility and harmony with nature, as shown in **Fig. 4**
- ❖ **5. Design Thinking Essence:**
 - **General character of the mall features simplicity and flexibility**, which are modern characteristics, alongside combination with the external environment [20].
 - **Movement flexibility** in the curved corridors and simple design. The internal courtyards provide users with a clear view of shops on both the upper and lower floors, **helping users gather along the movement path**.
- ❖ **6. Design Thinking Philosophy:**
 - Skylight roofs of the internal courtyards, designed as glass domes, **create a distinctive mental impression for shoppers and foster a sense of belonging to the space**.
 - Integration of natural environment with indoor spaces **creates tranquility and harmony**, providing a mental impression of comfort and relaxation [17].
- ❖ **7. Era Identity (time & place adaptation):** **The identity of the mall is adapted**, combining classic simplicity with a modern touch. The focus on giving the mall a distinct personality is reflected in the unique design of the classic facades with their simple elements, as well as in the tent structures and the interior design that blends with the natural environment. **This creates a sense of belonging and distinction, mixed with an aura of simplicity and elegance** that suits modern characteristics, leaving a unique impression on visitors' minds [16].
- ❖ **8. User Identity (culture & tradition):** The presence of restaurants and cafes overlooking the fountain **allows for the enjoyment of outdoor air and the surrounding spaces** dedicated to contemporary artistic performances, shown in **Fig. 10**. These areas attract shoppers to participate in celebrations, local festivals, shopping festivals, and advertising campaigns.
- ❖ **9. Surrounding Natural Environment Simulation:** The mall is situated in a desert environment. The **fabric structure tent is inspired by nature and have a primitive identity reminiscent of ancient Egyptians living in the desert**, but in a modernized form. They provide shading and aesthetic appeal while incorporating features to prevent air leakage, which reduces heat permeability within the space.
- ❖ **10. Mall Trademark:** The mall's logo features a convex lens or eye shape in blue, with a series of intersecting, flowing curves that **reflect the same flexible design spirit**, **Fig. 11**.



Fig. 10: internal shot for users watching a performance [15]



Fig. 11: Mall of Arabia trademark [15]

4.2.2. Mall of Egypt

Location: El-Wahat Road, 6 October City, Giza, Egypt

Founded: in 2017

Long: 450,000 m²

Mall Description: The largest commercial center in Egypt, was designed by RTKL and built by Orascom and BESIX for Al-Futtaim Group, and opened on March 2, 2017. It is LEED Silver certified and follows a long-term sustainability strategy [16]. Recent expansions added 15,000–25,000 m² of open areas, including outdoor seating, dining, and green spaces—about 6–8% of the total 450,000 m² site, **Fig. 12**.



Fig. 12: Mall of Egypt [24]

1. Sustainability criteria

❖ 1. Sustainable Site:

- located at the entrance of 6th of October City, which has a desert climate, on a major artery “El-Wahat Road”, shown in **Fig. 13**.
- **Suitable orientation** of the mall for **maximizing the use of natural light**.

❖ 2. Energy Efficiency:

- **Using wood** to cover some walls and internal columns reduces thermal loads.
- **Advanced insulation materials** in the skating rink saves on cooling energy.
- Using **tempered glass panels on exterior walls** to provide natural light and reduce thermal permeability to the mall's internal spaces [15].
- **Double glazing** for thermal insulation in windows and **relying on solar shading devices** as an external shading method to reduce the entry of solar heat indoors.

❖ 3. Water Efficiency:

- Reducing water consumption in restrooms by **using smart faucets** that automatically shut off when hands are removed [23].
- **Using gray water** for irrigating gardens and green areas in the mall.

❖ 4. Material Efficiency: **Appropriate building materials**, such as the type and thickness of insulation for perfect walls and ceilings.

❖ 5. Indoor Quality:

- Covering internal walls with **coated aluminum panels** to absorb excess heat within the space until the temperature drops, they release the stored heat back into the interior.
- Using **polycarbonate panels in skylights** to allow daylight diffusion while insulating against direct solar radiation, shown in **Fig. 14**.
- **Integrating natural daylight with artificial lighting** in corridors and interior plazas.
- Using **fire-resistant finishing materials** in most parts of the building [23].



Fig. 13: Mall of Egypt site plan.



Fig. 14: integrating daylight with artificial lighting [24]

Reference: google maps modified by researcher

❖ 6. Pollution and Waste Management:

- **Recycling and managing waste** generated from construction and building processes.
- Using **LED lights and energy-efficient bulbs** with lower carbon emissions, while relying entirely on industrial ventilation systems [25].

❖ 7. Heritage Preservation:

- Reflects egyption heritage through **Pharaonic motifs** on its façades and traditional interior elements like **mashrabiya, courtyards, and water features** [24].
- The use of the **vertically hanging luminescent mirror strips** improves ventilation and light diffusion, inspired by sustainable mashrabiya concepts.

❖ 8. Management:

- **Smart Control Systems:** to monitor the entire building and oversee all systems within it, including cooling and ventilation [25], as well as all electrical and mechanical systems, managed through an automated network called Building Management System (BMS).
- **Adaptive technologies:** responds to temperature used in the concrete surfaces of the external facade of the skating rink, shown in **Fig. 15**.
- **Variable properties technologies:** such as Photo-Luminescent cells used in exit signs, guidance, and emergency indicators on the walls [16].
- **Color-changing technologies:** using luminescent mirror strips and color-emitting strips on polycarbonate panels hanging from the ceiling in the atrium space of the mall (The Valley Plaza), as shown in **Fig. 16**.
- **Smart lighting sensors (Control Lighting):** to manage the intensity of lighting in corridors and interior plazas, optimizing the use of natural light where possible.
- **Photovoltaic cells:** installed on parts of the roofs [23].



Fig. 15: concrete surfaces responds to temperature [23]



Fig. 16: polycarbonate panels [23]

- ❖ **9. Transportation: Developing the surrounding road network** (Mall of Egypt Road), implementing road and bridge construction, and providing traffic solutions for the area leading to it [21] with the aim of providing safe access and exits for mall visitors and alleviating traffic congestion in the area [27], as shown in **Fig. 1 & Fig. 17**.

- ❖ **10. Outdoor Coordination and Parking:**

- **Partial shading of external walkways** (semi-covered) to blend with the natural surroundings.
- The external reception plaza, called “The Plaza”, features **water channels, a dancing fountain, and numerous landscaped areas**.
- Using **smart electronic services and sensors** to direct vehicles and monitor available parking spaces [25].
- Utilizing **photovoltaic solar panels** on lighting poles in the mall's outdoor parking areas.

2. Local identity

- ❖ **1. Building Form: The Egyptian identity and Islamic character are achieved in the massing of the structure elements** [24] such as: The Indirect entrance, The central courtyard, Terraces overlooking the courtyard, Mashrabiya and solar screens and Wooden canopies.



Fig. 17: Mall of Egypt road [27]



Fig. 18: Mashrabiya and solar screens and Wooden canopies [21]

- ❖ **2. Building External Shaping:**

- **The sensory beauty** is evident in the simple facades with a touch of distinction and elegance.
- The main entrance (made of **stone with engravings of Pharaonic symbols**).
- The proportions and locations of the openings are inspired by **Islamic architecture**.

- ❖ **3. Indoor Environment:**

- The **vertically hanging luminescent mirror strips** in the ceiling of “The Valley” atrium reflect visible light in various colors (**similar to the concept of stained glass in Islamic design**). They blend natural and artificial lighting, adding a sense of spirit and warmth to the space.
- **Shop facades are simple**, with a predominant modern character [24].

- ❖ **4. Site Coordination:**

- Using **perforated wooden coverings with Islamic patterns** to shade the external walkways, casting varying shadow shape, as shown in **Fig. 19**.
- The **external reception plaza, “The Plaza”**, features water channels, a dancing fountain, botanical elements, and a statue of the Egyptian woman, along with various landscaped areas [24].
- Some **external terraces** attached to the Food Court provide visual and auditory beauty.

- ❖ **5. Design Thinking Essence:** The mall predominantly features **an abstract Islamic character** [16], with design elements such as:
 - wooden Mashrabiyyas, the use of wood for shading external walkways with characteristic patterns that evoke warmth and blend with nature.
 - The indirect entrance leading to a preliminary entrance area, an open internal courtyard with a central water feature and terraces overlooking the courtyard.
- ❖ **6. Design Thinking Philosophy:**
 - **Integrating the natural environment** from ceilings and side strip openings in the internal plazas creates a sense of calm and harmony, providing a mental impression of comfort and relaxation, and stimulating the purchasing process [17].
 - The overall impression of the design is a **feeling of enclosure, warmth, and belonging, heavily relying on elements of Egyptian identity** [24], as shown in Fig. 20.



Fig. 19: Mall of Egypt road [24]



Fig. 20: The main entrance plaza vibes of enclosure & warmth [28]

- ❖ **7. Era Identity (time & place adaptation):** The identity of the mall is **abstract (Pharaonic-Islamic with a touch of simplicity)**. Emphasis is placed on giving the mall a distinct character through unique design elements, including **simple facades with Pharaonic engravings** and an interior design that integrates with the natural environment. All of this creates **a sense of belonging and a feeling of distinction**, blending simplicity with elegance (suitable for modern times), leaving a unique impression on visitors.
- ❖ **8. User Identity (culture & tradition):** The **harmonious of light and water displays, synchronized with various musical pieces**, create a joyful atmosphere upon entering the mall at the main entrance, “The Plaza” [28], with overlooked restaurants and cafes shown in Fig. 21, and includes some external terraces connected to the Food Court to benefit from natural ventilation and light while maintaining a connection with the outside. Additionally, **shopping festivals, contemporary cultural activities, and entertainment events** are held in the central plaza, “The Valley” [26].
- ❖ **9. Surrounding Natural Environment Simulation:** The use of **wooden elements (a natural material)** in Mashrabiyyas and for shading external walkways in the mall, along with a strong reliance on landscaping and water features, creates a natural aesthetic.
- ❖ **10. Mall Trademark:** The mall's logo features the letter "M", designed as two interlocking arches. This symbolizes the abbreviation of "Mall" and "Masr" (Egypt), **reflecting the spirit of contemporary design**, shown in Fig. 22.



Fig. 21: Gathering users around restaurants and cafes.

Reference: : [28]



Fig. 22: Mall of Egypt trademark

Reference: [15]

4.3. A consolidated Evaluation Checklist Matrix for the two malls

Table 4: A consolidated Evaluation Checklist Matrix for the three commercial streets

Evaluation checklist	sustainability techniques categories										Local Identity aspects									
	1.Sustainable Site	2.Energy Efficiency	3.Water Efficiency	4.Material Efficiency	5.Indoor Quality	6.Pollution and Waste	7.Heritage Preservation	8.Management	9.Transportation	10.Outdoor Coordination	1. Building Form	2. Building External Shaping	3. Indoor Environment	4. Site Coordination	5. Design Thinking Essence	6. Design Thinking	7. Era Identity (time & place)	8. User Identity (culture & ...)	9. Surrounding Natural ...	10. Mall Trademark
Mall of Arabia	Totally Achieved	✓	✓		✓		✓	✓		✓	✓			✓		✓	✓	✓	✓	✓
	Partially Achieved			✓	✓	✓			✓			✓	✓		✓					✓
	Not Achieved																			
Mall of Egypt	Totally Achieved	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Partially Achieved			✓															✓	✓
	Not Achieved																			

4.4. Results and Discussion

By analyzing the previous evaluation checklist matrix for the case studies, it can be resulted that:

- Compliance with sustainability assessment criteria in malls is highest in categories such as** (site selection, energy efficiency, water efficiency, indoor quality, environmental pollution and waste management where waste collection and recycling are facilitated, heritage preservation, operational management and outdoor coordination and parking).
- Meeting sustainability assessment criteria for malls is least achieved in categories such as** (material efficiency and transportation where the mall must be in a vibrant city center to make it easily accessible and serve the maximum number of residents).

3. **Meeting local identity assessment criteria for malls is most effectively achieved in aspects such as** (building form, building external Shaping, indoor environment including lighting, shop signage and gathering plazas, overall site coordination, design essence, design philosophy, adaptation with place and time, and cultural users' identity).
4. **Meeting local identity assessment criteria is most challenging for malls in aspects such as** (simulation of the surrounding natural environment and mall trademark identity).
5. The highest commercial mall in both sustainability techniques and local identity assessment is Mall of Egypt. It meets approximately 95% of sustainability techniques and 90% in local identity evaluation, proving that there is no conflict between achieving sustainability techniques and maintaining local identity.
6. Both of malls feature a distinct trademark identity that gives them a local identity, but all the trademarks are modern and do not follow city's traditional references. This is a design requirement in the future malls. Even if the mall does not have a specific local heritage identity, its trademark can become a local identity over time

5. A SYSTEMATIC STRATEGY (DESIGN FORM FOR FUTURE MALLS)

From the above study it can conclude that, when developing a successful architectural design thinking for a future mall, or developing an existing one, the following strategy should be considered:

1. Respect for Users' Culture and Traditions is a significant factor in achieving sustainability (heritage preservation category) as well as in maintaining local identity (user identity cultural and traditional aspect).
2. Mall's sustainability achievement is directly proportional to local identity preservation, so if we want to design a mall with a good design concept, we must pay attention to both local identity and architectural character for the mall's city.
3. If a mall deteriorates and requires redevelopment, it is essential to ensure that the architectural style is not obscured. The design should preserve the facades and the outdoor areas for social activities, which are key to maintaining the street's identity, as it is happened in the recent expansions in Mall of Egypt.
4. Achieving local identity impacts the evaluation of sustainability techniques (category of heritage preservation). However, the reverse can be adapted to fit the era (place, time, and users' traditions) and is known as "abstract identity", which is the highest level of identity should be achieved.
5. Integration between achieving sustainability techniques and maintaining local identity is a certain systematic strategy, and each can impact the evaluation of the other. For example, mall of Egypt demonstrates this
6. Concerning the suitable site of the mall in the center of the city to facilitate access and expand its service radius, it is a must category.
7. Using sustainable ideas in shading and providing natural lighting inside the mall atriums, and sustainable materials in finishing is a simple and cost-effective solution.

CONCLUSIONS

Integration between achieving sustainability techniques and maintaining local identity is a certain systematic strategy and each can impact the evaluation of the other as "heritage preservation" is a key category of sustainability techniques assessment and "abstract identity", which represents a high degree of design creativity, allows architects to use sustainability techniques by adapting identity vocabulary to align with contemporary sustainable technologies such as mall of Egypt's abstract identity. Therefore, it is a strong approach to achieving a perfect future design concept for the mall and enhances the mall's design value. There is more focus on the design of the indoor environmental quality of the mall than on the outdoor coordination design. This is a logical conclusion, where stimulating purchases and encouraging users to spend more time inside.

Future top-rated Egyptian malls must reflect the identity of the place (as they are tourist attractions points for visitors all over the world), while also considering time adaptation, the culture

and traditions of the city's residents, preserving their folklore and communal events, and preparing the mall to accommodate as many of them as possible during their festivals and shared activities. This reflects how deeply Egyptian culture is influenced by its rich heritage and authenticity in design, even achieving sustainable techniques without compromising its historic identity, therefore it is a perfect example to be followed.

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CONFLICT OF INTEREST

The authors have no financial interest to declare in relation to the content of this article.

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