ISSN-E: 2617-9563

“Design Requirements between Response and Change in Interior Spaces”

Muntaha Abdel-Nabi Hassan
University of Baghdad
College of Fine Arts
Montaha.abdulnabi1104a@cofarts.uobaghdad.edu.iq

Faten Abbas Lafta
University of Baghdad
College of Fine Arts
Faten.lafta@cofarts.uobaghdad.edu.iq

ISSN-E: 2617-9563

Abstract

The COVID-19 pandemic has significantly impacted various political, economic, and social domains, necessitating widespread and comprehensive changes. This is particularly evident in the design of interior spaces within hospital buildings, including spaces for isolation. These changes encompass various design requirements that alter interior spatial systems at multiple levels, with their effects varying according to the theoretical framework applied to interpret this process as a stimulus-response in the design system's performance and direction.

This can elucidate the nature of interior spaces as integrated systems of relationships that explain the role of change in these systems. These systems reflect the fundamental tasks sought by interior designers, informed by their understanding of hospital spaces' nature and the utilization of various possibilities, techniques, and methods to translate spatial requirements and employ them to frame their functional characteristics. This is achieved through the incorporation of insights and ideas to move towards the concept of health interface redesign, which has become an essential requirement for adapting to the current event.

Keywords: Requirements, Response, Change, Interior Space, Health Isolation.

الملخص

لقد أثرت جائحة كوفيد-19 بشكل كبير على مختلف المجالات السياسية والاقتصادية والاجتماعية، مما استلزم تغييرات واسعة النطاق وشاملة. ويتجلى ذلك بشكل خاص في تصميم المساحات الداخلية داخل مباني المستشفيات، بما في ذلك مساحات العزل. تشمل هذه التغييرات متطلبات التصميم المختلفة التي تغير الأنظمة المكانية الداخلية على مستويات متعددة، مع اختلاف تأثيراتها وفقًا للإطار النظري المطبق لتفسير هذه العملية كاستجابة تحفيزية في أداء واتجاه نظام التصميم.

وهذا يمكن أن يوضح طبيعة الفراغات الداخلية باعتبارها أنظمة متكاملة من العلاقات التي تفسر دور التغيير في هذه الأنظمة. تعكس هذه الأنظمة المهام الأساسية التي يسعى إليها مصممو الديكور الداخلي، مستنيرين بفهمهم لطبيعة مساحات المستشفى واستخدام الإمكانيات والتقنيات والأساليب المختلفة لترجمة المتطلبات المكانية وتوظيفها لتأطير خصائصها الوظيفية. ويتم ذلك من خلال دمج الرؤى والأفكار للتوجه نحو مفهوم إعادة تصميم الواجهة الصحية، والذي أصبح مطلباً أساسياً للتكيف مع الحدث الحالي.

الكلمات المفتاحية: المتطلبات، الاستجابة، التغيير، المساحة الداخلية، العزل الصحي.

1. Introduction

Designing interior spaces requires a delicate balance between "Response" and "Change," two fundamental aspects that shape the functionality and aesthetics of these environments. Response in interior design revolves around understanding and meeting the immediate needs and preferences of the occupants. This involves considering user comfort, lifestyle, and specific activities to ensure that the space caters to their requirements (Ching & Binggeli, 2018). Responding to spatial efficiency is equally crucial, where designers strive to optimize the use of space, addressing storage, circulation, and the placement of furniture. Aesthetics and mood are another key facet of response, where interior elements like color, lighting, materials, and decor work in harmony to create an atmosphere aligned with the space's intended purpose. Additionally, cultural and contextual sensitivity should not be overlooked, as spaces should resonate with the local context and traditions. Accessibility, through features like ramps and ergonomic design, is essential in ensuring inclusivity within the design.

On the other hand, Change in interior spaces revolves around adaptability over time. Flexibility is a pivotal element in this aspect, allowing spaces to be easily reconfigured to meet evolving needs or activities. Sustainability and environmental considerations are crucial for responsible design, emphasizing the use of eco-friendly materials and practices that reduce environmental impact. Technological integration plays a significant role, considering the incorporation of new technologies such as smart home features and advanced audio-visual systems (Schmidt III & Austin, 2016).

Designing interior spaces for health isolation requires a unique blend of "Response" and "Change" design requirements to cater to the specific needs of individuals in isolation while allowing for adaptability in response to changing health conditions and emergencies.

In terms of response, the foremost consideration is the physical and psychological well-being of the isolated individuals. Isolation spaces must prioritize comfort, offering a sense of security and support to those within. Adequate natural light, ventilation, and access to nature can promote mental and physical well-being. Spatial efficiency plays a role in optimizing the use of the limited space available while ensuring that it remains functional and not overly cramped (Altomonte et al., 2020). In this context, the response also includes rigorous hygiene and infection control measures, incorporating easy-to-clean surfaces, hands-free fixtures, and proper disposal systems. Design should also consider the creation of comforting and calming aesthetics, which can help reduce anxiety in those isolated.

As for change, health isolation spaces should be designed with flexibility in mind, particularly in response to unforeseen health emergencies. The ability to quickly reconfigure or expand these isolation areas is vital to accommodate changing demands. This means having modular and easily adaptable furniture and partition systems (Zaher, 2020). Technological integration is equally essential, with the inclusion of telehealth equipment, monitoring systems, and secure communication tools to facilitate remote medical consultations. Sustainable materials and practices should be employed to ensure that these isolation spaces can operate for extended periods without harming the environment. Lastly, staying up-to-date with evolving health regulations and guidelines is crucial to ensure that these spaces are compliant with the latest safety standards.

Balancing these design requirements for health isolation spaces ensures that the interior environment is both responsive to the immediate health and well-being of those in isolation and adaptable to the ever-changing landscape of health emergencies, making it an essential component in managing public health crises.

1.1. Problem of the study

Change is considered one of the concepts that has received wide attention since ancient times. The phenomenon of space cannot be isolated as a physical achievement that we exchange information about and document its details without understanding it as an expressive event with generative cultural and strategic values.

Change involves everything it encompasses in terms of mechanisms, conditions, and characteristics, following a system and purpose. It is a strategy for a series of changes that have occurred in various dimensions. Hospital spaces have lost many of their human meanings. Therefore, it was necessary to design interior spaces in different hospital buildings, within design formulations and configurations that are suitable for the level of the COVID-19 pandemic. Thus, the researcher formulated the research problem with the following question:

What are the design requirements that should be adopted in the interior space designs for health isolation?

These designs should enable designers to create design formulations based on the functional aspect and achieve performance value that corresponds to the level of the event.

1.2. Objective of the study

The current research aims to discover the design requirements in designing interior spaces for health isolation concerning their utilitarian and expressive aspects.

1.3. Significance of the study

The importance of the current research lies in the following points:

1. Providing intellectual material for researchers in interior design.
2. Benefiting from scientific material that keeps pace with the ongoing event, the spread of the COVID-19 virus.
3. Addressing the study of the change in the structure of the design system for health isolation spaces.
4. Enriching the research with academic and philosophical content that complements other studies in the field of specialization.

1.4. Limitations of the study

1. Subjective Limitations: Studying the design requirements between response and change in interior space design.
2. Spatial Limitations: The research includes the study of the variables of hospital systems that have introduced isolation spaces into their system in Baghdad, on the side of Al-Rusafa.
3. Temporal Limitations: 2020-2021 AD

1.5. Definition of study terms

1. Design Requirements:

- It is what generates the apparent, or direct operations, and represents the environment or the atmosphere in which the phenomenon or operations appear. It exists, evolves, and establishes a distinct relationship (Al-Asadi, 2005).

2. Response:

- It refers to the immediate and current needs or demands of the interior space. It involves how the design addresses the current purpose, functionality, and adaptability to the immediate activities and requirements of the space's occupants (Karlen & Fleming, 2016).

3. Change:

- Linguistically, change is defined as a word derived from the verb "to change" and means to transform something or substitute it with something else, i.e., to make it different from what it was (Al-Fayruzabadi, 2005).

4. Interior Spaces

- The term encompasses the physical and architectural aspects of these spaces, such as layout, design, furnishings, lighting, and other elements that contribute to their functionality and aesthetics (Hamdy Mahmoud, 2017).

2. Requirements for Effective Response to Events

2.1. Effective Response

The discussion of events is ongoing and continuous, often approached with seriousness and accompanied by gestures that reflect thoughtfulness. Events are considered an important issue addressed by various media outlets on a daily basis, penetrating all aspects of individuals' and society's lives (Maharsi et al., 2022). Nevertheless, discussions about events are often characterized by complexity, filled with data about obvious matters, and focused on describing the problem rather than responding to finding a solution. Despite the events of recent years, we have made very limited progress in understanding the meaning of an effective response to events and how to integrate it into the process of change to create systems that adapt to the event's developments. Since the stimuli that can be defined, and accompanying a response, are numerous, they can generate fear and anxiety in individuals, leading to changes in their behavior. Therefore, contemporary psychologists have classified stimuli into two types:

- External or Extrinsic Stimuli: Extrinsic stimuli refer to events that can be directly identified, such as natural disasters and wars.
- Internal Stimuli: On the other hand, internal stimuli refer to events that cannot be directly pinpointed, such as the spread of pandemics.

It is worth noting that whether intrinsic or extrinsic, stimuli lead to specific responses. The nature of the response varies according to its source, whether it is from an individual, organizations, or governments. It also varies from one society to another, and even within the same society depending on the era. Several different positions may emerge regarding the same event, and similar positions may differ regarding the same event (Al-Askari, 2015).

For significant events or events related to ideas, knowledge, or those that challenge traditions and customs in society, an effective response requires societal engagement. Either its effects become immediately evident within the context, or it manifests by the elimination of conflicting elements. If multiple different responses exist in one context, they urgently call for the activation of such a response. In case of a delayed direct response, the intellectuals and leaders must take the initiative. Effective responses are linked to awareness and rely on it. The awareness of the elite can lead to societal awareness, but it requires the necessary factors.

Defining the concept of response is no less difficult than defining the concept of stimulus. Responses performed by individuals are highly varied, ranging from simple involuntary reflexes to complex behaviors like thinking, insight, and problem-solving. Psychologists generally agree that a response is an action or a specific part of an individual's observed behavior. Like stimuli, responses should be identifiable, either directly or indirectly. However, they differ from stimuli in that they can be defined without referring to or signaling the event that provoked them. The event is not considered a stimulus unless it triggers or provokes a response (Calarco & Gervais, 2009).

It is worth noting that in most cases, defining a simple, specific response by emphasizing its details is difficult. Therefore, psychologists emphasize the general aspects of the response more than the specific, detailed aspects. To determine the response, it is essential to consider its speed, strength, and permanence since these quantitative aspects of the response result from learning and depend on the stimulating context.

Thus, every action has a corresponding reaction, a response to an event. These responses can be automatic or non-intentional in their nature and appearance, depending on the nature and type of the event at hand.

2.2. Types of Response

The English historian Arnold Toynbee was able to crystallize the relationship between humans and their environment into four responses:

1. Negative Response: This response is attributed to human backwardness and their inability to bring about change or development in themselves and their surrounding environment. They succumb to it, and its impact on individuals is evident. This represents the highest level of change inevitability.
2. Adaptive Response: In this type, humans attempt to change based on new developments. Due to their limited capabilities, they adapt to their environment, but it continues to affect them. Here, the necessity of change remains prominent.
3. Positive Response: In this response, individuals can seek change to overcome environmental challenges and crises to fulfill their needs. They alter the environment to serve their purposes, marking the initial degrees of change possibility.
4. Creative Response: This is the level where individuals go beyond mere adaptation and imitation; instead, they innovate and create, revealing their true potential for limitless creativity. Here, this response represents the pinnacle of change possibilities.

A response is the behavior that an individual exhibit in reaction to a stimulus. Responses can range from simple bodily changes, like reacting emotionally to a frightening sight, to simple body movements or complex behaviors, such as rearranging one's environment. Often, a specific response is associated with a particular stimulus.

Responses can be simple, as a simple reflexive action involving low-level neural and brain activity, or they can be complex, requiring thinking and the ability to judge matters. This depends on the maturity of the nervous system and the soundness of the brain. Responses can become more intricate and take time to materialize as a reaction to a stimulus. As individuals achieve psychological and cultural maturity, their responses become more complex, and they carefully plan and execute them. There are two types of responses:

- Conditioned Response: This response is triggered by a conditioned stimulus that has been altered in quality or state. It's a response to a stimulus that couldn't elicit it before the change in quality or state (Schacter, 2009).
- Unconditioned Response: This form of human activity is distinguished by its sudden appearance without prior individual experience. These responses are automatic, non-intentional reflexes in nature and appearance, falling under the category of biological data.

2.3. The Evolution of Change as a Prerequisite for Event Integration

Transformation and development have occurred since the beginning of existence and the globe. This evolution includes changes in systems, connections, human ideas, behaviors, customs, traditions, and all aspects of social, economic, cultural, and technical life. Change has become a major topic in interior design since then. Interior design naturally adjusts to changing environmental circumstances. This involves creating a change and adaptation strategy to meet risks and crises by recognizing interior space strengths and weaknesses and reforming its processes, systems, and relationships to solve vulnerabilities.

The concept of change has varied according to researchers' perspectives. Some define it from the standpoint of transformation, while others view it through the lens of the outcomes it produces. Therefore, the concept of change remains somewhat unclear, characterized by the nature of the change in terms of form and substance, the interconnections and entanglements, the reciprocal and causal relationships, the direction and influence, as well as the flexibility and adaptability that can accommodate change (Hassan & Lafta, 2022).

Al-Taiti (2011) asserts that change involves a transition from a specific state to another, which could entail changes in form or status. Meanwhile, Kamal defines change as a purposeful and directed alteration aimed at achieving environmental adaptation, both internal and external, to ensure the transition to a more problem-solving capable organizational state (Qassem, 2007). In essence, change represents the shift from one state to another, ideally improving upon the previous condition. Change is an organized strategy targeting the transformation of systems and relationships to meet the new needs of the space and to cope with the challenges imposed by the event. Change is characterized by several attributes (Abdel Baqi, 2003):

1. Necessity: Change is an essential and imperative element for interior design. Spaces cannot remain static for extended periods, as they must evolve toward improvement in response to unexpected events, global designs, modern technologies, and other factors.
2. Evolution: Change is a means of progression towards a better state, maintaining the transition of interior spaces from their current stage to a more advanced one (Lafta & Hussein, 2022).
3. Continuity: Change, by its nature, is a continuous process, whether through premeditated planning or the influence of unforeseen events, circumstances, and societal factors. Therefore, change falls within the category of phenomena that consistently occur within interior spaces.
4. Comprehensiveness: Change is associated with comprehensive substitution of all elements specific to interior spaces, aligning with their functional requirements and design needs.

3. Design Requirements for Healthcare Isolation Spaces

Every design endeavor adheres to specific design conditions and parameters that lead to a well-structured design system. Most interior designs are comprised of conditional and obligatory components integrated into design protocols with principles, procedures, and calculations intertwined within the processes of change. The determinants in the design of healthcare isolation spaces are primarily dictated by functional and performance criteria, sometimes involving temporal considerations.

For each design, there exists a system that can be conditional, based on the formal and functional system that aligns with the interior designer's philosophy. It can be parallel, dependent on various operational processes linked to organizational factors. The system incorporates multiple requirements that constitute necessary prerequisites for the achievement of its objectives in the change process, which is particularly evident in interior design. The overall system of the interior space may exert a significant compressive force equivalent to all functions performed within the design (Al-Bazzaz, 2002).

The design process relies on multiple design conditions and determinants, grounded in the interior designer's capacity for innovation. This innovation hinges on the application of their cultural background, mental acumen, and creative skills to devise methodologies and approaches for change operations characterized by seriousness and practicality. Design should align with these requirements concerning the system's components and their arrangement, aimed at fulfilling the intended purpose or function and achieving the desired change outcome.

The majority of these requirements are related to performance and functional aspects. They stem from the mental treasure trove of the designer in terms of employing change techniques, such as elimination, addition, integration, and more. These procedures and change operations are constrained by specific standards and engineering for conformance with individual physical capabilities.

Without a doubt, environmental requirements establish an interactive relationship between the interior space and the environment. It is a dynamic relationship essential to maintaining harmony between favorable conditions and the interior and exterior environment of the space concerning function and performance (Al-Asadi, 2017).

Consequently, societal, cultural, economic, and technological factors within the individual determine these requirements. The objective of the designer is to establish a correlation between the interaction of the occupant and the spatial environment and the characteristics of the climate that impact the area, including noise, temperature, humidity, ventilation, and sunlight. In order to prevent any adverse effects on the space's occupants, the designer must engage in meticulous mental calculations and contemplate the characteristics of these factors throughout the adaptation process.

Every interior space should encompass a multitude of conditions, standards, and variables. These must align with the nature of the performance and the type of function to be performed. They should contain a set of variables that evoke sensations in the interior designer, guiding their behavior towards intended goals for the completion of spatial organization and its relationship with the type of function and its data. The extent to which the building is suitable for the events that occur within it is dependent on specific conditions and standards, particularly in spaces of high importance, such as hospital spaces. These only function through precise requirements and criteria, and some of the essential prerequisites for the interior design of healthcare isolation rooms are:

3.1. Flexibility in Managing Change

The concept of flexibility hinges on the interior space's ability to anticipate the changes that a hospital building may face, hindering its performance, and its readiness to handle these variables and adapt to them to ensure its survival and continuity. Flexibility determines the continuity of relationships within the system and serves as a measure of the capacity of interior space systems to accommodate the variables that a hospital building might encounter. Many scholars regard flexibility as an organizational phenomenon that involves the building's ability to respond to events and crises (Khalid, 2009). It involves making appropriate changes so that the building can effectively respond to the ongoing event, thus enabling the hospital building to manage crises. Flexibility is distinct from the ability to adapt to changes; it entails the building's capacity to revert to its original state before the changes occurred within its systems, ensuring balance to enable it to persist in a turbulent environment.

Flexibility facilitates processes by saving time, reducing response times, minimizing costs, and promoting continuous improvement and change in the building (Khaytu, 2018). Flexibility has several dimensions (Hamilton, 2011):

- Structural Flexibility: This refers to a set of changes in the organization that allows the designer to add or eliminate certain elements, resulting in modifications to the interior's organizational level.
- Strategic Flexibility: It's the building's capacity to navigate and choose between alternatives for elements and materials, enabling it to confront environmental variables.
- Operational Flexibility: This measures the flexibility of the building's systems and their responsiveness to rapid and continuous changes, allowing for creative initiatives by designers to meet ongoing transformations. In the context of a hospital, high flexibility is essential due to working in a volatile and complex environment that necessitates adaptation to change to ensure continuity.

In this context, flexibility means the ability to tailor the building and its spaces to evolving spatial requirements. Flexibility in a hospital is crucial as it needs to respond to ongoing changes that lead to spatial alterations in the building, which must have high durability to make these changes feasible with minimal costs. Therefore, the hospital's design structure should encompass the highest degree of flexibility. It can extend in multiple directions with the same efficiency as changing the use of a single space. Thus, we find that flexibility is linked to two approaches concerning

its relationship with the physical structure of the hospital building. The first approach allows the structure to be responsive to change without incurring costly physical alterations, where the boundaries of change fall within the performance level or individual level. The second approach involves change and modification, defining the process and mechanism by which the building is transformed to accommodate change (Al-Ahababi, 2019).

3.2. Spatial Sequencing of Interior Space Activities

The sequencing in the organization of the spatial environment is built upon the interaction between humans and space on one hand, and the nature of configuration and human-to-human relationships on the other. In some carefully planned interior spaces, this may also take the form of a deliberate sequence. The determination of the function type and the selection of activities that have a tangible impact on choosing the appropriate sequence within the nature of spaces, taking into account their spatial qualities and expressive potentials, embodying the principle of a gradual transition from public spaces to private spaces. Public spaces are composed of interactions and interconnections of individual spaces. From this perspective, the significance of spatial sequencing and its concept in spatial composition emerges, representing different levels of specificity and generality, illustrating the regularity of spaces in a hierarchical progression beginning from general spaces to semipublic ones, such as interior connecting spaces, and ultimately reaching private spaces and isolation rooms. This sequence encompasses levels of spatial composition within the hospital building based on interactive spatial relationships and the required specificity of connectivity (Al-Bazzaz, 1999).

Therefore, we find that the nature of space encompasses the study of the constituent activities, which can be grouped according to their nature to gain knowledge about hospital spaces. These activities can be segmented into smaller parts according to the design for the assembly, approximation, and classification of these activities based on user types. More than one type of user can participate in a single activity, aiding in the spatial sequencing of the hospital. Additionally, determining the specificity of the activities based on their performers may be required, which could be relied upon to specify the specificity of spaces associated with those activities (isolation spaces). Thus, collections of spaces with different activities become designated for a specific group of users.

The easy and seamless connection of interior spaces leads to ease of use and the determination of shared activities, which can be directly or indirectly related to each other. These relationships result in the separation of activities and, consequently, the comfort and ease of movement between different spaces. The linking relationships between activities or the relationship of separation and division give importance to some public spaces within the hospital (Thuwaini, 2010).

3.3. Natural and Artificial Lighting in Healthcare Isolation Spaces

Lighting has a profound impact on the well-being of both patients and the medical team treating them. Therefore, it is meticulously designed according to established criteria, guidelines, and strong scientific foundations that take into account the psychological and physiological effects of these elements on hospital users. Hence, providing sufficient natural lighting through openings, open courtyards, and increasing the area of glass walls is essential. Alternatively, simulating natural environmental lighting is required. Studies have revealed the inadequacy of artificial lighting in terms of the wavelength of green and blue colors and ultraviolet, resulting in symptoms of disturbance and mood swings. This deficiency can be attributed to the inadequate spectrum of sunlight, which affects the neural transport and hormone systems. Other studies have emphasized the importance of natural light in performance efficiency. According to these studies, the lack of sunlight and ultraviolet rays can lead to various psychological, physical, and mental health issues (Al-Alwan & Bayk, 2017).

The combination of light and color has the effect of calming patients. Lighting constitutes a decorative domain and is aesthetically interconnected with every other component of interior design. Light possesses the supreme ability to unveil objects, exhibiting minute details. Shapes are revealed by lighting, which can render an object appear planar or accentuate the proportions of distinct spatial levels.

The intensity and quality of lighting significantly impact proper vision, leading to breathlessness, movement impairment, and discomfort caused by light reflections. Additionally, the color of light alters the color of the surfaces it falls upon, leading to a failure in the patient's perception of colors.

Natural lighting has an advantage over artificial lighting in providing clarity in interior spaces that is hard to achieve with artificial lighting. It imparts qualities of harmony and consistency to interior space elements derived from natural lighting and clearly distinguishes between levels of interior space and vertical walls and horizontal ceilings.

Artificial lighting is the primary source used in interior spaces, employing efficient lamps and positioning them appropriately within the space. This enhances the efficiency of interior lighting intensity and minimizes its negative effects (Naney, 1998). Artificial lighting is characterized by:

- Relying on the quality of lighting fixtures as a fundamental basis.
- Ease of controlling its intensity, quantity, and distribution within the healthcare isolation space.
- It falls under engineering services related to the final steps of space design.

Based on this, two types of systems for interior space lighting in healthcare isolation spaces can be identified:

Firstly, General Lighting: It refers to the uniform and diffuse illumination of the healthcare isolation space from various angles. It can be either direct or indirect. This type of lighting aims to create a visually comfortable environment with minimal contrast between the light source and the illuminated surfaces in the space. Among the best lamps used for this type of lighting in isolation spaces are fluorescent lamps, characterized by their soothing white light with minimal shadows (Al-Safadi, 2008).

Secondly, Focused Lighting: It is a type of localized lighting used to focus and emphasize specific areas or objects within the space. Its key features include illuminating specific portions of the space, with the light source typically placed near the equipment or the areas that need focus. This type of lighting utilizes directional and controllable lights and adds variety to the space, aiding in specifying particular activities within the isolation space (Al-Akam, 2010).

In structures of lighting systems used in healthcare isolation spaces, strips and grids are frequently employed. These strips are made of plastic or non-reflective aluminum to prevent optical glare. They assist in increasing the illuminated area, ensuring uniform distribution.

Good visual performance does not, nevertheless, depend exclusively on the illumination levels. Additional aspects pertain to the quality of illumination that extend beyond merely furnishing the necessary quantity. Although lighting designed to serve a particular purpose in a given space may satisfy or surpass the minimum standards for visual performance, it may not guarantee the visual comfort of patients. Particularly if the space is occupied for an extended duration, this may negatively affect human psychological health. Consequently, the height and location of the light unit in the isolation room must be carefully considered, with a preference for avoiding contact with the patient's head.

Therefore, it is imperative to take into account the qualitative dimensions of illumination by ensuring a consistent distribution in order to prevent notable disparities between areas of light and shadow. Also crucial are the reduction or elimination of glare to an acceptable degree and the prevention of intense reflections on smooth surfaces caused by direct illumination. The significance of this is highlighted in figures (1) and (2).

Figure (1): illustrates the lighting system in patient living room areas

Figure (2): demonstrates the lighting system in corridor passages

3.4. Color System Design in Healthcare Isolation Spaces

Throughout history, ancient civilizations, including the Babylonians, Assyrians, and Egyptians, widely practiced color therapy. They understood the tremendous healing effects of sunlight and exposed themselves to it for therapeutic purposes. They also recognized the importance of light and the colors present in crystals and gemstones found in the Earth's crust. Ibn Sina's "The Arab Physician" (980 AD) is one of the most significant medical works ever created. In it, Ibn Sina discussed the role of color as a diagnostic tool and a practical revealer. With the evolution of modern treatments, surgery, and medications, color therapy was not considered a form of treatment deserving serious study. Nevertheless, Dr. Edwin Bates spent several years authoring his book "The Principles of Color and Light," which was published in 1878. His efforts contributed to rekindling interest in the fields of the ethereal energies, reviving the powers of color and light and their combined influence on individual health (Sun & Sun, 2007).

Color is one of the most important elements, tools, and pillars upon which the design composition of interior spaces relies, and it holds a profound connection in our lives and all aspects of our activities. Color has three main effects:

- Psychological effects related to the influence of color on the individual's psyche.
- Physiological effects concerned with the impact of color on the body.
- Aesthetic, visual, and formative effects of color.

The psychological effect of color: Colors affect the mind, causing vibrations that evoke either comforting or disturbing thoughts. They can convey feelings of joy, happiness, sadness, or melancholy. Thus, the psychological effect is divided into direct and indirect effects. The direct effect can manifest a general sense of happiness or sadness, while the indirect effect varies according to individuals.

In certain instances, the physiological impact of color extends beyond its psychological influence and affects an individual body part or group of body parts exclusively physiologically. The disorders induced by the color red, as well as the invigorating and tranquil effects of yellow and green, are unquestionably physiological in nature.

In general, we find that colors have a significant impact on the intensity of light in a space. Some colors absorb a considerable proportion of the incident light, such as dark colors, while lighter colors reflect the incident light to a large extent. The reflectivity of light varies from one color to another, as illustrated in figures (3) and (4).

Figure (3): illustrates the use of natural wood-inspired colors, particularly light brown, in the Al-Faqih Hospital in Dubai

Figure (4): demonstrates the use of natural wood-inspired colors, especially light brown, in a patient's room

3.5. Hospital Space Movement Systems and Corridors

Patient comfort begins with the thoughtful design of interior corridors within healthcare facilities. This involves avoiding intersections and ensuring that individuals move through them with care and consideration. It is essential to slow down the pace and maintain a sense of privacy while keeping these pathways open and visible to patients. Designers can use corridors to create different impressions for patients. They can be designed openly to provide a classic aesthetic, instilling a sense of grandeur in the building. Alternatively, they can be designed to navigate specific spaces with reasonable proportions, giving a feeling of familiarity and simplicity in space utilization.

When designing internal corridors for isolation spaces in hospitals, the following considerations are crucial (Abdel-Qader, 1990):

- Visitor circulation paths must be clearly separated from direct supply routes for various equipment and devices.
- These corridors should be designed to prevent accessing one department through another to avoid the spread of infection and workflow disruption.
- The movement pathways must allow supply operations in the hospital without hindrance. Stairs and elevators should be centrally located with separate pathways for inpatients and non-resident patients.
- It's advisable to avoid long corridors to prevent a sense of monotony and intimidation. This can be achieved by limiting the corridor's length to no more than 30 meters (Shadli, 1992). Corridor width should be suitable for easy wheelchair use and the movement and rotation of patient transport trolleys, as illustrated in Figure (5).

Figure (5): illustrates models of hospital space corridors at Cleveland Clinic in Abu Dhabi

- Emphasize the entrances to sub-corridors by using focused lighting and distinctive colors to highlight these openings. This helps patients comprehend the space and facilitates movement within.
- Install fire safety measures in corridors to prevent fire propagation and provide emergency egress during an outbreak. Avoid using flammable wall coverings and install automatic doors every 30 meters to avoid smoke or fire spread.
- Directional signage should be placed at an appropriate height and should use distinctive colors to highlight different areas' functions within the corridors.

In cases of vertical circulation, which is of utmost importance, multi-story buildings should be equipped with elevators if there are multiple floors. Each elevator should have specific dimensions, roughly 2 meters in width and 3 meters in depth, and the elevator room should be approximately 1.70 by 2.67 meters for patient transport using stretchers.

3.6. Environmental Control Systems in Isolation Healthcare Spaces

The control of indoor air quality in hospitals has gained increasing attention in light of the challenges faced by healthcare facilities, particularly those in resource-limited, predominantly developing nations, in combating the spread of airborne infections. However, studies covering the relationship between natural ventilation and airborne infection transmission are limited. Generally, ventilation in any occupied space is meant to provide clean air and remove generated heat. In healthcare facilities, natural ventilation should also contribute to infection control.

Hence, natural ventilation is a crucial aspect of integrating and connecting with the external environment, significantly impacting the design process and ensuring the thermal comfort of indoor occupants. Despite the benefits of natural ventilation, it should not be relied upon in isolation spaces, as infection control measures demand control of inward-to-outward transmission. As a result, designers have shifted towards closing direct ventilation openings and relying on industrial ventilation systems, which filter and sterilize the air before it exits to external spaces (Baraban & Durocher, 2010).

Over time, hospitals have moved away from the idea that fresh air and sunlight are beneficial for individuals. Windows have been closed and replaced by mechanical ventilation systems, and the concept of using windows to circulate air has gradually faded. Some industrialized nations have turned to industrial ventilation to reduce the risk of infection transmission between patients, leading to increased use of air conditioning and other systems, which has negative environmental consequences.

Ventilation can play a significant role in regulating air quality in hospitals. Viruses can be transmitted through the movement of indoor air within the hospital, infecting other patients and the healthcare staff. Therefore, Lim et al., (2010) has proposed an industrial ventilation system to achieve negative pressure in patient isolation spaces. Negative pressure isolation rooms are expensive in terms of construction, operation, and ventilation flow rates, limited to 12 air changes per hour.

When properly designed, industrial ventilation offers the benefit of consistent circulation, which contrasts with the unpredictable characteristics of natural ventilation in certain geographical areas. When natural ventilation is coupled

with hybrid ventilation, any deficiencies in natural ventilation performance can be compensated for. By increasing the airflow from the interior to the exterior, industrial fans can assist in the formation of negative pressure environments by generating internal air pressure that is lower than that of the ambient air.

Spaces with negative pressure are designated for patients suffering from airborne infections, as the low air pressure inside prevents the escape of air, hence stopping disease spread within the hospital. The requirements for positive air pressure differentiation between protective environment spaces (spaces for highly contagious cases) and other patient rooms involve the use of high-efficiency filters, capable of 99.97% efficiency for particles larger than 3 million microns. The protective environment room should only have one bed.

3.7. Isolation Systems for Healthcare Isolation Wards

There are two scenarios used in studying, comparing, and measuring the nature of spaces:

- Physiological Condition: It has garnered significant attention from those interested in the topic of noise. Specific noise levels have been studied and determined to pose a direct threat to patients. Exposure to noise at certain levels has been found to constrict blood vessels, alter heart rhythms, and even cause dilation and expansion in the pupils of the eyes. Therefore, it is assumed that exposure to high levels of noise can lead to increased blood pressure and potentially result in heart diseases and muscle tension. The most significant physiological effects arising from internal noise in hospitalized patients include:

    - ❖ Influencing the activity of muscles and internal organs due to neuronal cell tension.
    - ❖ Generating a sense of stress, changes in heartbeats, and difficulty in breathing. Thus, it is evident that patients, while under the influence of weakness and nervous tension, may experience aggravated symptoms due to noise exposure (Thabet, 1997).
    - ❖ High noise levels can gradually lead to hearing loss, in addition to their confirmed impact on cases of nervous breakdown, especially in large hospitals.

- Psychological State of Patients: Noise can affect the psychological health of patients, particularly those living under psychological stress. Noise can make patients feel annoyed and agitated, as it is considered a source of disturbance. Furthermore, noise is regarded as a disruptive factor in interpersonal communication. Noise is essentially a psychological concept that refers to unwanted, unpleasant, and intolerable sounds.

Internal noise generated by the movements and various activities inside isolation spaces, along with the sounds produced by individuals, including patients, visitors, and nursing staff, is a significant cause of noise in isolation spaces. This includes the sound of footsteps by a large group of individuals, as well as the movement of patient carts or the transportation of devices and equipment (Baucom, 1996).

In this context, we find that indoor spaces within hospital buildings are exposed to both external and internal noise. The scientific approach to solving the noise problem involves studying a set of aspects to achieve acoustic comfort and efficiency. In general, noise should be reduced to a level that does not harm health, providing psychological comfort to patients, typically around 30-40 decibels (Raafat, 1996).

Designers reduce hospital sound frequencies based on their functions. This is achieved by using sound-absorbing materials for different frequency ranges on walls, ceilings, and floors and designing and proportioning the interior space. If the floor is tiled and the walls and ceiling are smooth, sound reflection makes the space noisy. However, if the floor and ceiling are uneven, the walls are covered with sound-absorbing materials like perforated wood or other materials, the ceiling is covered with perforated tiles backed by insulation (fiberglass), and the floor is covered with rubber or vinyl, the space becomes peaceful. Insulation absorbs much of the sound and prevents it from entering the inside. To reduce noise from all activities, the designer must apply design measures (Baucom, 1996; Raafat, 1996):

- ❖ Utilizing secondary ceilings for sound insulation, which should be continuous and free from openings along the space and not connected to the floor of the upper level in the case of multi-story construction.
- ❖ Air conditioning and ventilation fan noise are engineering service noise. Systems must be separated from space structure. Air conditioning and ventilation ducts spread noise. Apply sound-absorbing materials to duct interiors and combine them with flexible joints to decrease vibrations. Use flexible joints at the space-entry duct end.

- ❖ Reducing noise levels can be partially achieved by using room components, wall and floor coverings, and the building structure itself as sound insulation.
- ❖ To limit sound transmission from the gap between the door's bottom and the floor, rubber strips should run the length of the door. Rubber strips automatically link to the door handle, rising when opened. Sealing window frames with rubber strips prevents outside vibrations and sound from entering.

3.8. Fire Suppression System Design in Isolation Spaces

Fire suppression systems are utilized in most spaces hosting public activities and functions that require control and protection against fires. This protection is essential for safety and security in every space, particularly when it comes to the lives of individuals (Al-Bayati, 2012). Saving lives is the primary objective in the event of a fire breaking out in any building. Therefore, it is necessary to alert and inform individuals inside the space as soon as a fire occurs so that they can evacuate before the flames spread, making it difficult for them to escape. Consequently, there should be a means of fire notification and warnings to alert individuals. Designers employ fire suppression systems in the hospital environment to ensure the safety of patients and medical staff, minimize the extent of damage caused by fires, and achieve a rapid response to deal with fires. The techniques and modern fire control methods differ based on building structures and functional requirements (El-Gamal, 2007).

Traditional fire suppression methods should not be overlooked (fire extinguishers of foam and dry chemical types, carbon dioxide fire extinguishers, and water hoses). These should be distributed throughout various sections of the space, such as corridors, entrances, and spaces that contain flammable materials like alcohol and chemicals (Al-Bayati, 2012).

3.9. Guidance Signs and Signage Systems

The symbolism of signs and symbols embodies a symbolic expression for us. It plays a crucial role in hospital spaces as it consists of various visual elements such as words, drawings, images, and symbols. These elements are presented in a simple way, much like sentences that are understood before they are spoken or written. True perception is not solely linguistic but also includes connotations and symbols (Mohsen & Ghazwan, 2023).

Symbols in sign and signage systems enable mental communication that matches the recipient's nature and awareness. Non-direct symbols provide mental representations that can be transformed into different meanings through verbal communication (Khudair, 1999). Effective signs symbol use allows a cognitive dialogue that matches the recipient's understanding. Abstract symbols that conjure human identities and function interpretations can transmit the symbolic qualities of life experiences shared by all people, regardless of location or society.

Therefore, guidance signs should not be underestimated in isolation spaces, given their essential role in directing and guiding visitors and the wealth of instructions and warning guidelines they contain to avoid many risks. Hospital spaces often house hazardous areas like sterilization rooms, laboratories containing samples from patients, and more. Guidance signs can be divided into several categories (Pile, 2009):

- Interior signs: There are things like directories and maps that indicate rooms and their respective numbers in accordance with buildings, individuals, or purposes. These signs can be found at the primary and secondary hospital entrances.
- Simple maps: They play a critical role in large and complex spaces like hospitals. These maps are placed at the beginning of corridors and hallways.
- Direction signs: These guide visitor movement and help determine the locations of elevators, staircases, restrooms, information spaces, and patient service areas.
- Emergency signs: Fire safety regulations dictate that signs indicate paths leading to exits and staircases for use in case of a fire, as well as locating emergency equipment boxes.
- Pictograms: Pictograms may replace textual information for clarity, which represents an evolution for many common signs and labels.

- Digital signs: Digital signboards are widespread in hospital halls and waiting areas. They provide vital content that improves patient and visitor experiences and cuts wait times. Hospitals can use digital signage for employee communication and menu boards in cafés and dining areas.

Figure (6): illustrates a model of guidance signs, symbols, and graphic illustrations in the hospital environment

3.10. Sustainability and Biophilic Design for Hospital Buildings

Hospital buildings are complex structures, serving various functions such as patient care, treatment, and administration. Given the significant reliance of modern medicine on technology, many perceive modern hospital buildings as being in conflict with sustainability. Nevertheless, sustainability has become a global imperative, especially in the midst of crises like the COVID-19 pandemic. Sustainability is not limited to preserving the environment, energy, and resources; it extends to healthcare facilities, enhancing patients' recovery and well-being. This goes beyond environmental considerations in healthcare buildings, as it encompasses the human dimension and the achievement of social sustainability, considering the psychological comfort of patients as an integral part of the treatment system, a factor that designers must take into account (Bensalem, 2011).

Hospital buildings should always maintain a human dimension in design and operation. They should meet not only the physical but also the psychological and emotional needs of individuals. Excessive functionalism in design can turn a hospital into silent, sterile boxes connected by long, cold corridors, where individuals lose their humanity and identity and become mere machines. Numerous research studies have indicated that the human aspect of the building has become a therapeutic necessity. Residents, whether patients or healthcare teams, should feel safe and reassured. Interior spaces, their size, forms, layouts, and fluidity, can create a suitable atmosphere to meet these essential psychological needs, especially as modern hospitals are highly specialized and equipped with the latest mechanical, electrical, and electronic devices. This places a significant burden on interior designers to stay up-to-date, especially in the field of medical engineering. Administrators and doctors often tend to focus on functional utility, but the psychological aspect of patients should not be overlooked, particularly in the design of patient rooms, hospital entrances, waiting areas, and the use of natural lighting where possible.

Therefore, (Biophilic Design) is considered one of the sustainability trends in hospital buildings and is among the most prominent studies that address the connection between human health and natural concepts, with a strong theoretical connection to the concept of healing environments. Biophilic design leverages biophilia, the innate human tendency to connect with nature, to achieve positive and rejuvenating health experiences through immersive representations with elements of the natural world in indoor spaces. Additionally, it provides features of healing spaces, such as natural ventilation and natural lighting, which positively affect both patient well-being and behavior (Steg et al., 2013).

There are several health-enhancing strategies that can be adopted in isolation spaces, where some health-enhancing strategies have been employed within spaces by rearranging biophilic design elements and features and incorporating them into several mechanisms. These strategies are (Guenther & Vittori, 2008):

- Direct Connection with Nature: This entails connecting with natural elements, relying on continuous human inputs and influence over existence through tangible elements of nature inside the space. It is achieved through the continuity between the interior and exterior spaces through openings (doors and windows), providing natural views from inside the space, as illustrated in Figure (7).

- Indirect Connection with Nature: This is achieved through the use of artwork and paintings that mimic patterns and forms found in nature, as shown in Figure (8).
- Plants: Plants can have a significant positive impact on the healthcare environment. They reduce noise levels, enhance privacy, improve air quality, absorb carbon dioxide by 10%, increase humidity, as well as shown in Figure (9).

Figure (7): demonstrates direct interaction with elements of nature

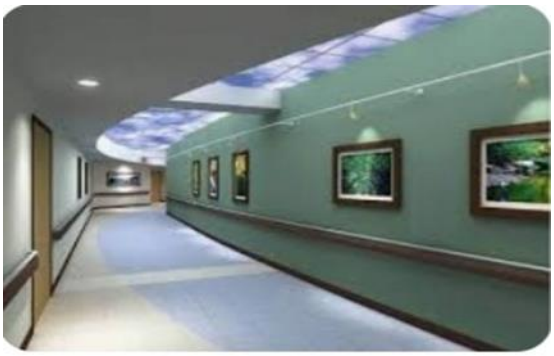

Figure (8): depicts the role of paintings representing natural landscapes in the hospital space

Figure (9): illustrates the role of plants in a hospital space at the Bellevue Medical Center in Lebanon

4. The utilization of appropriate technology in the design of healthcare isolation systems

The term "appropriate technology" gained recognition during the energy crisis of 1973 and the environmental movements of the 1970s. This term is used in two specific domains:

- The first domain involves employing the most efficient technology to meet the needs of evolving or developing areas.
- The second domain pertains to using technology that aligns with environmental and social considerations.

In the context of design, the term "appropriate technology" becomes more evident. A well-suited design is defined by its ability to satisfy specific human needs through a wide range of controls. Therefore, the design of a space should always be appropriate, considering various factors such as ease of use, adaptability of design to the physical conditions adopted by the patient within the interior space (furniture, equipment, and devices), safety, the choice of appropriate materials, their performance nature, environmental design considerations, and environmental conservation (Murray, 2005).

Modern technologies play a significant role in designing healthcare isolation spaces by utilizing advanced materials and implementing new techniques. These technologies are sound-based and change our interaction with them. For instance, they can facilitate design changes in touchless spaces, making tasks like door opening and elevator buttons more accessible. Furthermore, integrating automation tools, sound or motion activation techniques, and sensor applications, such as lighting systems that adjust based on occupancy, helps minimize direct contact and reduces the risk of infection (Aly, 2021).
In addition to the aforementioned technologies, two types of technologies should be available in healthcare isolation spaces:

- High-Performance Electronic Sterilization Gates: The gates allow hospitals to sterilize patients, staff and visitors and remove viruses before entering the building. They safeguard everyone, especially those who need direct interaction to prevent illnesses. These gates can be controlled automatically or manually, employ ionized water for sterilization (which decomposes into non-polluting elements, water, and oxygen), and have motion sensors for automatic sterilization.
- Ultraviolet (UV) Sterilization: Anti-COVID-19 technology uses ultraviolet light. Wavelength divides it into UVA, UVB, and UVC. Ozone layer absorption reduces UV ray energy, making most that reach Earth UVA. UVC, the third type, disinfects due to its shorter wavelength and higher energy, according to the CDC. When calculating the ultraviolet radiation dose needed to kill viruses, room geometry, shade, time, and substance or object must be considered.

5. Design Considerations for Negative Pressure Isolation Rooms

Isolation rooms with negative pressure are designed by increasing the rate of air withdrawal from the isolation area compared to the indoor air. This generates negative air pressure within these spaces concerning the surrounding air, which prevents air from escaping. Consequently, this hinders the spread of viruses inside the hospital. In other words, achieving negative pressure in isolation spaces is essential to prevent the transmission of infections from isolated patients to others within the hospital. Therefore, it's important to adhere to the following guidelines (Ducel et al, 2002):

- Selecting an isolation room location away from areas with air currents such as elevator doors and staircases is mandatory.
- An anteroom (a zone separating the isolation space from the external corridor) should be included in isolation rooms to regulate the airflow and prevent air from escaping when the door is opened. It is also important that the doors leading into the isolation room and the anteroom are parallel to one another.
- Isolation room doors should have top and side air leakage prevention measures. Air leakage should be prevented except for the 1/2-inch gap between the door and the room's floor. All window and plumbing, drainage and medical gas line openings should be sealed with air leakage prevention solutions.
- Healthcare isolation rooms should not have secondary ceilings. If necessary, complete the ceiling and walls to specifications before installing the secondary ceiling. Surface-mounted lighting should replace secondary ceiling recessed fixtures. Apply sealant around tiles to avoid microorganism and dirt buildup.

- Non-porous vinyl or rubber floor tiles should be used for the floor for both isolation and ease of cleaning.
- The isolation room door should be equipped with a glass window to reduce the frequency of opening and closing the door, which could compromise negative pressure.
- Air recycling is not recommended in isolation rooms. Instead, the space should be supplied with 100% fresh air. The recirculation of air should be avoided, and the air should be expelled entirely, with air purification to remove 97.99% of microorganisms and viruses using high-efficiency filters before discharging the air to the outside.
- Solace rooms need electrical pressure gauges to monitor pressure. This guarantees the isolation room has negative pressure compared to the corridor or anteroom 24/7. Some pressure gauges convert air movement from the positive side (corridor or anteroom) to the negative side (isolation room) into an electrical signal indicating the space's pressure relative to the corridor. If pressure rises above a predefined level on the gauge, it alerts nursing staff visually and audibly. Pressure gauges should be visible outdoors or at the nursing station and connected to the central alarm system.

Conclusion

In accordance with what has been discussed in the theoretical framework, the research has led to several conclusions that can be summarized as follows:

1. A deeper understanding of the concept of an event and its resulting changes in the functional and spatial structures of hospital spaces. The interior designer is influenced by the event and takes a fundamental stance in the design process to express this impact. The event is not just a feeling but a tangible reality that occurs in a specific place and time.
2. Realistic events require an immediate response from individuals and institutions to address their risks by making long-term changes closely linked to the crisis's end. This can be achieved through the designer's ability to adapt to the ongoing events.
3. Flexibility enriches the strategy of change in hospital interior spaces. It involves deriving new methods and mechanisms to accommodate evolving events and guiding the change process to adopt various methods based on these developments.
4. Lighting is a crucial component in hospital spaces, affecting not only space perception but also the physical and psychological well-being of patients.
5. Colors are among the fundamental aspects that fall within the change strategy for health isolation spaces. A color system that aligns with the space's nature and function, positively affecting the patient both psychologically and physically, should be achieved.
6. Light and color in health isolation interior spaces intersect and integrate at the level of interior surfaces, whether horizontal or vertical delineations and furniture. The use of cool, soothing colors is essential to create an internal environment that takes into account psychological, physical, and behavioral dimensions.
7. Environmental control systems in health isolation spaces (cooling, heating, ventilation) contribute to renewing the internal space's vitality and maintaining the patient's health and comfort.
8. Both natural and mechanical ventilation and air movement within interior spaces play a crucial role in controlling the environmental conditions. They help ensure thermal, psychological, and health comfort for the patient.
9. Reducing the effects of noise through thoughtful designs for health isolation spaces is essential. This factor is at the forefront of the influences in creating a comfortable internal environment within health isolation spaces.
10. Adequate pedestrian corridors within hospital spaces are essential to ensure distance between patients, visitors, medical staff, and between carts.
11. Signs and signages employed within the interior spaces of health isolation represent visual data that constitutes a concise linguistic discourse that translates into directive behavior leading individuals to building spaces. Furthermore, they provide educational guidelines about prevention and infection avoidance.
12. Applying the sustainability concept is a necessity in hospital spaces, using plant containers in health isolation spaces to deepen the visual connection with the external environment. Additionally, employing artistic works to achieve psychological comfort and enrich the aesthetic aspect of the space.
13. Breaking free from old traditional methods in interior space design and searching for modern technical and material advancements to keep pace with contemporary designs and developments.

14. Modern technology and advanced techniques support the change strategy in designing interior spaces for health isolation. Especially technologies that contribute to avoiding direct contact with space elements to prevent infection, using sensor-controlled remote devices.

References

Abdel Baqi, S. A. M. (2003). Organizational Behavior: A Contemporary Applied Approach. New University House.

Abdel-Qader, W. A. M. (1990). Design Requirements in Public Hospitals, Master's Thesis, Faculty of Engineering, Cairo University.

Al-Ahababi, R. N. A. (2019). Flexibility in the Design of Surgical Suites – A Case Study of Local Hospitals. Department of Architectural Engineering - Architectural Design, University of Technology, Baghdad.

Al-Akam, A. J. (2010). Aesthetics of Architecture and Interior Design. Majdalawi Publishing and Distribution.

Al-Alwan, H. A.S., & Bayk, Y. H. H. (2017). Harmony of Architecture with Nature – Sustainable Design Towards Human Health and Well-being. UAE Journal of Engineering Research, 22.

Al-Asadi, F. A. (2005). "Design Requirements in the Open Environment of Baghdad". Unpublished Doctoral Thesis, University of Baghdad, College of Fine Arts, Department of Interior Design.

Al-Asadi, F. A. (2017). Interior Space and Adaptation Mechanisms. Al-Fath Printing, Copying, and Preparing Office.

Al-Askari, A. A. M. (2015). The Impact of the Event on the Context and Architectural Response. Iraqi Journal of Architectural Engineering, 4.

Al-Bayati, N. Q. K. (2012). Principles and Concepts in Interior Design (1st ed.). Diyala University.

Al-Bazzaz, A. (2002). Designing Design/Studies in Art (1st ed.). Dar Al-Fares for Publishing and Distribution.

Al-Bazzaz. (1999). Designing Relationship Spaces and Spatial Relations. Ministry of Culture and Information.

Al-Fayruzabadi, M. A. (2005). Al-Qamus Al-Muhit. Beirut, Lebanon: Al-Risalah Foundation.

Al-Safadi, J. (2008). Principles of Design and Artistic Formation. Damascus University.

Altomonte, S., Allen, J., Bluyssen, P. M., Brager, G., Heschong, L., Loder, A., ... & Wargocki, P. (2020). Ten questions concerning well-being in the built environment. Building and Environment, 180, 106949.

Aly, H. S. (2021). The Future of Workplaces Post (Covid-19) Towards Integrating Biophilic Design and Smart Technologies in The Office Workplaces. Journal of Urban Research, 39(1), 1-27.

Baraban, R. S., & Durocher, J. F. (2010). Successful Restaurant Design. John Wiley & Sons.

Baucom, A. H. (1996). Hospitality Design for the Graying Generation. New York, U.S.A.

Bensalem, S. (2011). Sustainable Healthcare Architecture - Designing a Healing Environment. The University of Texas at Austin - School of Architecture. Center of Sustainable Development.

Calarco, A., & Gervais, J. (2009). Adaptability: Effective Response to Change. Mohammed Bin Rashid Al Maktoum Foundation, Al-Obeikan Research and Development Company, UAE.

Ching, F. D., & Binggeli, C. (2018). Interior design illustrated. John Wiley & Sons.

Ducel, G., Fabry, J., & Nicolle, L. (2002). Prevention of hospital acquired infections: a practical guide. Prevention of hospital acquired infections: a practical guide., (Ed. 2).

El-Gamal, T. (2007). Fundamentals of Fire Science (1st ed.). Dar Al-Fikr Al-Arabi.

Guenther, R., & Vittori, G. (2008). Sustainable Healthcare Architecture. John Wiley & Sons.

Hamdy Mahmoud, H. T. (2017). Interior architectural elements that affect human psychology and behavior.

Hamilton, K. (2011). Flexibility, Differential, Obsolescence, and Measurement. HERD Journal, 4(4).

Hassan, M. A. N., & Lafta, F. A. (2022). The event and the inevitability of change in the design of interior spaces: 10.2478/bjlp-2022-001092. Baltic Journal of Law & Politics, 15(2), 1423-1438.

Karlen, M., & Fleming, R. (2016). Space planning basics. John Wiley & Sons.

Khalid, A. K. (2009). Hospital Design: Case Study from Jordan (Master's thesis). University of Jordan.

Khaytu, O. H. (2018). Methods for Improving Environmental Efficiency According to Adaptive Architecture (Doctoral dissertation). University of Damascus.

Khudair, R. H. (1999). Meaning and Expression in the Process of Designing Interior Environments, College of Fine Arts, University of Baghdad.

Lafta, F. A., & Hussein, A. G. A. (2022). COMMUNICATION AND FEATURES OF UPGRADING IN INTERIOR DESIGN. International Journal of Early Childhood Special Education, 14(3).

Lim, T., Cho, J., & Kim, B. S. (2010). The predictions of infection risk of indoor airborne transmission of diseases in high-rise hospitals: Tracer gas simulation. Energy and Buildings, 42(8), 1172-1181.

Maharsi, R. R., Sugiharti, H. I., & Handayani, M. (2022). SAYURBOX REPURCHASE INTENTION DURING COVID-19 USING THEORY PLANNED BEHAVIOR: 10.2478/bjlp-2022-001111. Baltic Journal of Law & Politics, 15(2), 1708-1723.

Mohsen, B. M., & Ghazwan, M. A. (2023). Modernism in Graphic Design. Journal of Namibian Studies, 33 (Special Issue 2), May 21.

Murray, T. (2005). A conceptual examination of product design, appropriate technology and environmental impact. Green Design Institute.

Naney, R. (1998). Daylight in Building. The H.A. of Solar Heating and Cooling Programme, International Planning Associations, Maryland, U.S.A.

Pile, J. F. (2009). Interior Design - Furniture and Accessories. Al-Nahda Printing.

Qassem, K. (2007). Change Management: Foundations and Principles with an Overview of Modern Change Strategies. Journal of Humanities, 34.

Raafat, A. (1996). The Trilogy of Architectural Creativity - Environment and Space (1st ed.). Interconsult Research Center.

Schacter, D. L. (2009). Psychology, Catherine woods.

Schmidt III, R., & Austin, S. (2016). Adaptable architecture: Theory and practice. Routledge.

Shadli, S. S. (1992). Supply Movement Pathways and Public Networks as Influences on Hospital Design, Master's Thesis, Faculty of Engineering, Cairo University.

Steg, L., van den Berg, J. I. M., & De Groot, J. (2013). Environmental Psychology: An Introduction. John Wiley & Sons.

Sun, H., & Sun, D. (2007). The Secrets of Color Therapy. Al-Farasha Printing and Publishing.

Thabet, A. H. (1997). The Impact of Human Needs on the Design of Public Spaces in Hospitals (Psychological Needs of Users), Master's thesis, Cairo University.

Thuwaini, A. (2010). Principles of Architectural Design (1st ed.). Dar Gabs for Printing, Publishing, and Distribution.

Zaher, N. H. E. D. A. (2020). Design solutions for interior architecture post coronavirus (COVID-19). Journal of Arts & Architecture Research Studies, 1(2), 117-133.