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RESEARCH ARTICLE – ART AND HUMANITIES MISCELLANEOUS

Innovative Use of Smart Lighting in Interior Design

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Abstract

The world is witnessing radical changes as people are affected by changeable variables to varying degrees. To keep pace with the era of globalization and information and take what you can benefit from. It is necessary to develop the first effective solutions to reduce their damage to the greatest extent possible. Therefore, the innovation of employing smart lighting refers to creating a new Smart lighting a modern tool that combines technology and innovation to enhance the quality of life in indoor environments. It contributes to improved productivity and comfort by adjusting light levels and temperature to suit various activities. Smart lighting also adapts to natural light and customizes the ambience to meet users' needs, with remote control capabilities via apps or voice commands. Additionally, it reduces energy consumption, reinforcing its role in environmental preservation and promoting sustainability, through smart lighting things can be seen with the naked eye or through other means that sense light. The research concluded that smart lighting has become an integral part of modern interior design, as it combines aesthetics and practical functions. Smart lighting allows for controlling lighting levels, changing colours, and modifying patterns as needed. These innovations embody a radical shift in how lighting is used as technology is combined with aesthetic arts to achieve results that go beyond the traditional concept of lighting. The research concluded that the concept of innovation is related to the actual and intellectual aspects that drive it to adopt new ideas and solutions in developing the organizational structure from the traditional thinking that characterizes the individual's style.

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Keywords: Smart lighting; Pediatric dental clinics; Interior design; Innovation; Perception.

1. Introduction

In the era of information technology and innovation, smart lighting has become an integral part of modern interior design, Smart lighting has become an essential element in modern interior design, combining both aesthetic and functional aspects. It enhances user experience by adjusting lighting to suit various activities and integrates seamlessly with advanced technologies like the Internet of Things (IoT). Additionally, it supports sustainability by reducing energy consumption and promotes health and well-being by aligning with natural light cycles. Smart lighting offers flexibility in design, making it an ideal choice for homes, offices, and commercial spaces, where it adds sustainable aesthetic and functional value.

Combining aesthetics with practical functions. Smart lighting allows for controlling lighting levels, changing colours, and modifying patterns as needed, contributing to improving the quality of life within residential and commercial spaces. Smart lighting is a means of saving energy, as it can be controlled remotely through smartphone applications or home automation systems, reducing energy consumption and contributing to preserving the environment. In addition, using smart lighting contributes to creating comfortable work environments, enhancing concentration and productivity, and improving the visual experience in interior spaces. These innovations embody a radical shift in how lighting is designed and used, as technology is combined with aesthetic arts to achieve results that go beyond the traditional concept of lighting. Therefore, studying the use of smart lighting in interior design is an important topic that deserves research and analysis, to understand its effects and effectiveness in creating more comfortable and attractive spaces.

2. Research Methodology

2.1. Research problem

The research problem raises the question: What is the innovative mechanism for employing smart lighting in interior design?

2.2. Research importance

The importance of this research lies in highlighting the innovative use of smart lighting in pediatric dental clinics, aiming to improve interior design and create a comfortable and safe environment, thereby enhancing the patient experience and adding unique value to clinic design.

2.3. Research aims

The research aims to reach the following results: The research aims to explore innovative mechanisms for utilizing smart lighting in interior design, with a focus on improving the environment of pediatric dental clinics. The research seeks to explain how smart lighting can contribute to creating a comfortable and healthy atmosphere, enhancing the patient experience through a design tailored to their specific needs.

2.4. Research boundaries

Defining research boundaries is an essential step to proceeding with research. Accordingly, the research areas were represented by the following:

- Temporal scope: The temporal scope of the research is from 2018 to 2022.
- Spatial scope: The spatial research area is represented by Pediatric dental clinics, in the United Arab Emirates.
- object scope: Innovative use of smart lighting in interior design by studying the variables of innovative smart lighting on visual perception through its functional and aesthetic performance in the interior spaces of dental clinics.

2.5. Research methodology

Due to the exploratory nature of this research, the researcher adopted a descriptive methodology to analyze the samples of the study. Indicators derived from the theoretical framework and previous studies were used as components in developing the analysis form, which served as a research tool. This form included all variables and elements enabling the researcher to achieve the mechanisms of employing smart lighting innovatively and its role in designing interior spaces. It also aimed to identify areas of complexity in contemporary interior designs of general and private medical clinics, specifically pediatric sections. The study evaluated the effectiveness of these designs in providing communicative, functional, and aesthetic meanings at the spatial level.

3. Research Theoretical Aspect

3.1. Innovation concept

Innovation is referred to here as "involving all aspects of an individual's life so that innovation indicates a certain type or style of life. Innovation here is the force that seeks completion"[1].

The innovative mechanisms for utilizing smart lighting in interior design rely on combining technology with aesthetics to meet functional needs. These include smart control through apps and voice assistants, adapting to natural light with light sensors, and flexible design using LED strips and adjustable colours. Smart lighting helps save energy through motion sensors and energy consumption analysis, as well as integration with smart home systems. These mechanisms create comfortable and sustainable environments, whether in homes, offices, or commercial spaces while enhancing productivity and highlighting design identity ،The innovative process "results in a new product as a result of the interaction that occurs between the individual with his distinctive style and what he encounters in his environment" [2]. It includes feeling the problems and gaps in a field, then renewing some ideas and setting hypotheses that address these problems, testing the validity or falsity of these hypotheses, and communicating the results to others. Administrative innovation is "the processes of making rational decisions, developing the human mind and developing the organizational structure so that all of this affects the actions related to the actual aspects of innovative thinking" [3]. In creative thinking, the leader's ability to envision distant and near results and innovate solutions emerges. The creative leader does not rely on traditional solutions but has the courage and ability to take risks in adopting new ideas and solutions that differ from stereotypical thinking and the conventional method [3].

In general, after innovation: "A creative idea that includes implementation differs from invention, and it is the process of envisioning and implementing a new method to achieve a result or perform a job."

3.2. Innovation and its role in employing smart lighting:

Innovation represents the designer's ability to recall the largest number of ideas suitable for a given situation within a relatively short period. The design innovation process must be based on a general approach and a fixed base, and in its employment, this depends on the nature of the contrast between the work and its surroundings[2]. By studying these variables, specialists in this field have determined the rate of lighting levels required for different interior spaces[4]. With the advent of the digital age, the innovation of more intelligent systems has become more common. In general lighting systems, industrial lighting control has been partially shifted towards the system itself. This new type of lighting system includes monitoring sensors (controllers) that control the lighting based on inputs from the sensors so that energy consumption is reduced while providing the required lighting and communication units between the sensors and the controllers. This system is hereinafter referred to as the intelligent lighting system. The design of smart lighting systems to reduce energy consumption (and therefore, operational costs) should also focus on the initial investment required to deploy the system. In existing buildings, in particular, it is preferable to use intelligent lighting systems that require minor or no modifications to the existing lighting system infrastructure. Energy consumption in smart lighting systems is represented by the dimming of those lamps above the control areas with sufficient daylight. This control strategy is commonly known as daylight harvesting and is often combined with occupancy-based control in a smart lighting system[5]. The light available in the different control zones is typically measured using a light sensor. A light sensor is an electronic device with an integrated light-sensitive element that measures the amount of light reaching the element and the illumination level reached at the light-sensitive element. In typical light sensors, only light from specific directions is allowed to reach the light-sensitive element in the light sensor[6].

The maximum angle concerning the axis perpendicular to the surface of the light sensor from which light is allowed in. Technological innovation may promise to stimulate lower environmental impacts through increased energy efficiency and product design that encourages reuse and the use of benign materials. However, as new technologies emerge, it is easy to overlook the environmental burden of technology

transition and premature replacement. While product recycling can lead to gains in energy efficiency, it can also contribute to the creation of expanded and diverse waste streams[5].

3.3. Factors affecting children's perception in dental clinics:

- Smart lighting and its role in enhancing functional efficiency in dental clinics: Smart lighting plays a vital role in enhancing efficiency within dental clinics, as it contributes to improving vision for doctors and providing a comfortable environment for patients, especially for children who may feel stressed during treatment [7]
- Improving doctors' vision: Smart lighting, which allows controlling the intensity and quality of lighting, reduces medical errors and increases the effectiveness of procedures for the operation. Smart systems can adjust lighting according to the type of treatment or the treated area, which contributes to enhancing the accuracy of operations[8].
- Creating a comfortable environment: Lighting contributes to creating a comfortable atmosphere that contributes to reducing anxiety and stress in children. Warm and soft lighting in waiting areas can help improve the psychological state of patients before treatment, leading to a more positive experience[9].
- Saving energy and costs: Smart lighting systems use technologies such as LEDs that consume less energy, leading to reducing the operating costs of the clinic. This makes the clinic more financially and environmentally efficient[10].
- The impact of lighting on mental health: The relationship between good lighting and improving the psychological state of patients has been studied, leading to a more positive treatment experience[11].
- Smart lighting applications in clinics: Applications such as controlling lighting by sensors or applications provide a more personalized experience for patients, increasing their comfort[12].
- Ventilation and environmental quality control: A good ventilation system in clinics helps control the spread of infection and odours, which contributes to providing a healthy and safe environment for both patients and staff. Good ventilation design enhances the efficiency of the clinic and reduces the need for future modifications[13].
- Materials used in construction: The choice of materials used in floors, walls and furniture affects the functional aspect of the clinic, especially in terms of cleanliness and ease of maintenance. The use of materials that are characterized by durability and ease of sterilization, such as vinyl and stainless steel, contributes to improving the quality of health care provided[14].
- Functional flow planning: The design of the functional layout of the clinic is based on reducing the overflow of patients and reducing waiting time. Modern clinics are based on designs that rely on open spaces with dedicated corridors to facilitate patient movement and provide privacy[15].
- Smart lighting that reflects the aesthetic details of the dental clinic’s identity: Smart lighting and aesthetic details are an essential part of dental clinic design, as they reflect the professional identity and enhance the patient experience. Here’s how both smart lighting and aesthetic details contribute to shaping the identity:
- Improve patient experience: Smart lighting contributes to creating a comfortable environment that reduces stress for patients, reflecting the clinic’s identity as a friendly and comfortable space. The intensity and type of lighting can be adjusted according to different needs.
- Mood control: Smart lighting can control the overall mood of the clinic, as soothing lighting helps enhance patients' feelings of comfort[16].

Enhancing Children’s Sense of Confidence in Dental Clinics: Choosing Colours and Their Psychological Effect Colours play an important role in influencing the psychological state of individuals, especially in therapeutic spaces such as dental clinics. Colours can stimulate specific psychological responses based on their properties, saturation levels, and brightness. Calm and soothing, cool colours such as blue and green are considered the most relaxing in medical settings. Blue, for example, promotes feelings of calm and confidence, and has a calming effect on the nervous system, making it suitable for treatment environments where doctors want to reduce patient stress. Green, due to its association with nature, promotes a sense of relaxation and tranquillity and is considered a neutral colour that helps stabilize moods. Warm and stimulating colours, which are warm colours such as yellow and orange, tend to increase activity and energy but can be excessive in some therapeutic environments if used excessively. Yellow can create a sense of optimism and positivity, making it useful in children’s clinics where it can relieve stress and fear. On the other hand, orange can be used in waiting spaces to promote warmth and welcome. Neutral colours and their psychological impact: Colours such as white and grey are commonly used in medical clinic design. White promotes feelings of purity and cleanliness, but it can create a cold or uncomfortable environment if used heavily without balance with other colours. Gray is more flexible and reflects modernity and professionalism, but it needs to be balanced with warm colours to create a comfortable atmosphere[17].

3.4. Considerations for the success of interior design:

These global models reflect the advanced use of smart lighting in the design of medical clinics, which contributes to improving the patient experience and enhancing the effectiveness of treatments, especially in dental clinics where the psychological aspect is very important[18]. Here is how both smart lighting and aesthetic details contribute to shaping the identity:

a) Smart lighting:

- Improving the patient experience: Smart lighting contributes to creating a comfortable environment that reduces stress for patients, reflecting the clinic’s identity as a friendly and comfortable space. The intensity and type of lighting can be adjusted according to different needs[5].
- Mood control: Smart lighting can control the overall mood of the clinic, as soothing lighting helps enhance patients’ feelings of comfort[17].

b) Aesthetic details:

- Choosing colours and interior design: Colours contribute to enhancing the clinic's identity, as calm colours can be used to relieve anxiety or bright colours to make the environment livelier[17].
- Using artistic decorations: Decorations and artistic elements such as murals add an aesthetic touch and create a fun atmosphere as shown in Figures 1-3, reflecting the clinic's identity as a space for children[5].
- Balancing beauty and comfort: Providing comfortable furniture with an attractive design that reflects professionalism and increases user comfort, enhancing the clinic's identity as a reliable destination for dental care[19].

Figure 1. Adding some smart interactive screens and furniture in the form of animal models to provide aesthetic, functional, and psychological aspects for children

Figure 2. Adding functional and aesthetic furniture complements pediatric dental clinics to provide a suitable environment and enhance their psychological comfort. Smart lighting has been used in dental equipment and also in oral cleaning areas on both sides

Figure 3. Employing directional lighting and an interactive screen to enhance children's psychological comfort Midtown Midtown Dental clinic is one of the world's high-class dental clinics

3.3. Theoretical framework indicators

- The reliance on performance and functional innovation in modern lighting methods as a principle to challenge the laws and aesthetic rules in interior design by forming the complex overlapping body to confirm the signal with new ideas and techniques to blend the old and the new, and therefore it is characterized by the unusual in the design of the interior space for children.
- The concept of innovation and its role in employing lighting on the style and aspects of the individual's life, that the power that drives completion includes the processes of making the right decisions and developing the mental and organizational structure and affects the connection with the actual aspects and innovative thinking and the quality of innovation (talent, self-realization) in adopting new ideas and solutions that are different from the stereotypical thinking and traditional style that characterizes the individual's style.
- The main role of children is represented in the process of visual perception and translating what it contains innovative decorative and functional components and reflection in the formal structures and aesthetics of design.

4. Research Practical Aspect

4.1 Research community sample

Research community Given the extensive scope of the research population, represented by innovative lighting in dental clinics, particularly in pediatric sections, the researcher focused on framing the research community. The sample included two clinics: Apolonia and My Pedia Clinic ("My Child's Clinic") in the United Arab Emirates. The selection of the research community was based on the researcher's continuous search for the best examples of lighting design in pediatric dental clinics. These clinics demonstrated a diverse range of interior design approaches within their spaces. Accordingly, the research community is defined as follows: innovative lighting in pediatric dental clinics, with specific emphasis on interior design diversity and its effectiveness in achieving functional, communicative, and aesthetic goals.

- Research sample Given that the study focuses on innovative smart lighting and its impact on visual perception in interior spaces, as well as its role in achieving creative interior design, a purposive sampling method was adopted.
- The selected sample represents the original research community with two (2) models chosen from a total of six (6) innovative smart lighting designs in pediatric dental clinics, representing 33% of the research population. These samples were selected based on the following criteria and reasons:
- The selected models were intentionally designed to meet high standards of interior and architectural design.
- The samples were chosen based on expert opinions in the relevant scientific and professional fields related to the research topic.
- Diversity in the composition of lighting units and the requirements that modern lighting technologies must fulfil.
- Geographic diversity was considered in selecting the sample locations.
- Flexibility in the distribution of lighting units in interior designs, allowing designers creative freedom to introduce new forms of lighting unit designs.
- Each of the selected models featured unique design characteristics and a distinct identity.
- Apollonia Clinic (Al Khalidiya Branch) – 2017
- My Pedia Clinic (Dubai, UAE) – 2014

4.2. Research tool application

Since the researcher relied on the descriptive method to analyze the research models and in the absence of a pre-existing analytical tool designed with validity and reliability, a customized analysis form was developed. This form encompassed the aspects targeted by the current research, specifically the mechanisms of employing innovative smart lighting and its role in designing interior spaces, as included in the selected research sample. To ensure the accuracy and reliability of the data collected through the form, it was designed based on: Indicators Derived from the Theoretical Framework The theoretical framework resulted in indicators drawn from sources, references, and literature in the fields of interior design and architecture. These indicators were instrumental in formulating the analytical structure of the study. Utilization of Findings from Previous Studies The study benefited from the outcomes of previous research, integrating relevant findings to support the analysis and enhance the depth of the investigation. Expert Opinions and Discussion‹Opinions from experts were collected through responses to the initial analysis form, aiming to present their perspectives on identifying the research axes and their relevance to the study's objectives. Based on their feedback, the researcher developed a finalized analysis form, incorporating the experts' modifications and suggestions. This iterative process granted the form its objective validity. Analytical Form Components The finalized analysis form covered the following axes:

- Innovative Smart Lighting System Variables in Interior Spaces Effectiveness of innovative lighting for children in interior spaces, encompassing methods, aspects, and processes. Communication-oriented organization of innovative lighting messages in interior spaces. Technical system variables of innovative lighting in interior spaces.
- Innovative Lighting and Its Reflection in Interior Spaces Impression of innovative lighting design transformations in interior spaces. Aesthetic innovation of modern lighting methods in interior spaces. Mechanisms of employing innovative lighting. Representation of lighting in interior spaces according to specific frameworks.

4. 3 Instrument validity

To ensure the appropriateness and comprehensiveness of the analytical instrument, the tool's validity was assessed after completing all research materials. The analysis form was presented to a panel of experts to evaluate its adequacy in light of their scientific observations. Based on their feedback, necessary modifications were made, and the form was finalized with a consensus on its validity. Thus, the form attained its apparent validity for application in the analysis conducted in this research.

4.4. Model description and analysis

4.4.1. Description of the first model: Apollonia world clinic

This clinic is located in the United Arab Emirates - Abu Dhabi (Al Khalidiya). It was established in 2017 by the Apollonia team. Modern methods were used in construction, implementation, and design. This is reflected in the interior space of the clinic, which relied on the rectangular shape in the interior formation, where the height of the space reached (3 m). The connection between the wall and the ceiling was

done using (a gypsum board) in white Gypsum formations were also added to the ceiling and the display screen for patients. Lighting was used in a point-distributed manner throughout the space. The lighting was placed on the ceiling in an innovative way to give the feeling of sunlight, which is a yellow balloon. As for the directed lighting distributed in the ceiling and the appearance of the white balloon, it gives a feeling of comfort and illuminates the largest possible amount of space. The location of the window in the corner allows sunlight and natural light to enter during the day because natural lighting gives the recipient comfort and reassurance by merging nature with space. As for the clinic floor, white granite material was used with small black veins. There are shelves on the wall for display and a work chair with its tools, galaxies, and cabinets sequentially. The floor and walls are regularly distributed and there are special devices for the clinic and the patient's ward and its directional lighting and also some decorative elements in the form of lighting clouds and balls snow crystals and small planes for decoration. The walls were painted white with some light colours, which are blue and yellow because children's spaces should have light colours that are comfortable for the eye and give the character of comfort and spaciousness to the space. On the walls and ceilings are cartoon shapes withdrawn and photographed paintings that add an aesthetic element to the interior space of the clinic as shown in Figure 4.

Figure 4. Shows the elements that space contains Employing innovative smart lighting in the children's clinic, as well as in the shapes available on the ceiling, to enhance comfort

4.4.2. Description of the first model: my pedia clinic

This clinic is located in Umm Hurair - Dubai - United Arab Emirates. It was established in 2014 and consists of several sections. It is special for children. The clinic's divisions include a waiting area for the child's companion. The main part is in the front, followed by the reception, and on the right side is a children's isolation room containing games and a small corridor. The rest of the fire rooms are made of glass and then the waiting room has a beige granite floor with a green and white border and walls. The reception part is wooden and contains cabinets hanging on the walls. A white table contains hidden lighting from below that reflects on the floor. Above the table is a yellow spot and a pendant light. Throughout the other spaces, the lighting is white. There is also hidden lighting and white directional lighting in the ceiling as shown in Figures 5 and 6. The ceiling contains also a central heating and cooling system. Wooden partitions separate one part from another, on the walls are decorative shapes, a display screen, and pictures of the medical staff in the clinic. Light colours are used in the clinic to provide comfort to the recipient's eye. After the reception, there is a link between it and the other spaces because it overlooks all the clinic rooms and the other spaces contain walls. Cartoon graphics can be controlled by remote control and use hidden and virtual white and natural lighting through the window during the day that overlooks the clinic garden.

4.4.2. Models' analysis

Phase 1: Variables of the innovative smart lighting system in the interior space

The effectiveness of innovative lighting for the child in the interior space in medical clinics, especially the children's department, was achieved in the ceiling and walls in natural lighting, the unity in shape was proportional, and the size and colour were harmonious in the space. A contrast was achieved when the lighting was hidden in the ceiling, while the natural lighting created harmony and effectiveness for the child, as in Figure 4. The arbitration process was conducted by evaluators specialized in interior lighting and design, where the images were assessed based on criteria related to artistic quality, and their ability to convey research concepts such as comfort, lighting control, and energy consumption reduction.

The concept of innovation is represented in a method, aspects, and processes. It was relatively achieved in the processes and their aspects. Innovation in the life of the individual is the force that drives him to be relatively achieved in the floors, ceilings, and walls, so he makes the right decisions. It was either achieved in the ceiling and walls through mental developments, and it was relatively not achieved in the development of the organizational structure of forms that link it in the actual and intellectual aspects through the type of innovation used that builds new ideas and solutions far from stereotypical thinking and the method of imitation among individuals with individual distinction in its concept and how it was applied in the interior space, as in Figures 4-9.

Organizing communication messages for innovative lighting in the interior space, where it is achieved in the ceilings and walls and distinguishes the connection between the individual and the space by organizing the message in the form and place and moral connotations and what is understood in the space in the form Figures 7-12, and is relatively achieved in the walls and ceilings for the recipients in general and the child and his parents in particular, and its form is simple and easy when recognizing the place and communicating with it. The space with these elements employed in it is explained in the form. The variables of the technical system for innovative lighting in the interior space must be available and achieved in the walls. Flexibility in spaces from one to another according to the nature of the activities held in it, whether the

space is for playing, teaching, waiting, or when entering the doctor's office, and visual excitement in children must be achieved in the ceilings and walls by employing some light colours that attract their eyes in shapes such as in Figures 6-10. and colours that excite and attract their attention and are relatively achieved if they are games or strange shapes that they can easily recognize when looking at them, because in children's spaces, we must excite the element of attraction and excitement by employing lighting, but at the same time we must generate a sense of depth in the space and achieve it in its height and enlarge the space and are relatively not achieved in the ceilings, floors, and walls by reducing it so that the recipient does not feel bored in the space coming to him.

Phase II: Innovative smart lighting and its role in interior space.

The impression of the innovative formal transformations of lighting in the interior space was relatively achieved in the ceilings and walls, and there is reassurance, pleasure, joy, and the absence of fear and anxiety from the space coming to it, as was explained in all the Figures 5-9. so that we do not face some problems when taking our children, some feel fear and some feel anxiety and discomfort and do not want to sit in the place, so we must make formal transformations so that it gives the children the impression of ease and simplicity in the space and they feel pleasure and reassurance when they are in the clinics.

The aesthetics of innovating the modern lighting style in the interior space are relatively achieved in the ceilings and walls, the form and complexity of the compound shape are two decorations that attract the child's visual perception and are achieved in the ceilings and walls by mixing or merging the old and modern styles, while modern techniques have been relatively achieved in the walls and ceilings, far from what they were in a dynamic, practical and easy space, relatively achieved without any effect when moving between the interior spaces in the form of Figure 8.

The mechanism for employing innovative lighting depends on the light used in the space, whether it is natural or artificial, and the colour of the artificial light, is relatively achieved in the walls and ceilings used, its intensity and brightness, and how the lighting units are installed and the method of installation, in their innovative decorative forms, as explained in Figures 5-7.

The light may be fixed in the walls and ceilings, relatively achieved and not subject to change, and is achieved in the walls and ceilings in terms of its colour, intensity, and brightness, while the variable light can be controlled according to the time in which the lighting is to be changed. Lighting is embodied in the interior space according to the fact that general artificial lighting systems are relatively achieved in the ceilings and walls that are evenly distributed in the space and are indirect, the local lighting and focused lighting are achieved in the ceiling of a specific thing to give it more beauty and movement, while the focused lighting is what the doctor uses when he does his work and is directly achieved relatively in the walls of the interior space as in Figure 6.

Figure 5. Mental developments displayed on screen space designated for females and males have been distinguished

Figure 6. Decorative elements of the ceiling and walls Everything related to the world and the Earth was provided in terms of supplements, lighting, and dental tools

Figure 7. Lighting, its variations and intensity in space

Figure 8. Flexibility in the diversity of activities

Figure 9. Using shapes on the wall to reduce anxiety and fear Using shapes on the wall to reduce anxiety and fear. Pictures of animals and simple lighting were provided, while artificial and natural lighting was integrated into the space

Figure 10. Apollonia clinic facade

Figure 11. Waiting area in Apollonia clinic

Figure 12. Natural and artificial lighting in space in this space has been used for females, as it contains animations for females, along with all the tools related to these animations

4.3. Research results

After analyzing the research samples, the researcher reached the following results:

- The effectiveness of innovative lighting for children in the interior space of medical clinics, especially the children's department, was achieved in the ceiling and walls with natural lighting. The unity was proportional in shape, and the size and colour were harmonious in the space. It achieved contrast when the lighting was placed hidden in the ceiling, while the natural lighting created harmony and effectiveness for the child.
- The interior design, including the representation of the concept of innovation in style, aspects, and processes, was relatively achieved in the processes and their aspects. Innovation in the individual's life is the force that drives him to achieve relatively in the first model and the second model, so he makes the right decisions, and either achieved in mental developments or was not achieved relatively in the development of the organizational structure of forms that link it in the actual and intellectual aspects through the type of innovation used that builds new ideas and solutions far from stereotypical thinking and the method of imitation between individuals with individual distinction in its concept and how it is applied in the interior space.
- The organization of communication messages depends on innovative lighting in the interior space, as it was achieved in the first model in the walls and distinguished in the connection between the individual and the space by organizing the message in the form and place and moral connotations and what is understood in the space. It was achieved relatively in the second model among the recipients and the child and his parents in particular. Its form is simple and easy when recognizing the place and communicating with the space with these elements employed in it.

5. Conclusion

In light of the research study's objective, the indicators that resulted from the theoretical framework, the procedures and analyses adopted to achieve the purpose, and the results obtained, the conclusions emerged as follows:

- Through the content of the effectiveness of innovative lighting for the child in the interior space from natural and artificial lighting through the characteristics of shape, size, and colour. The lighting unit in the ceiling was compatible with the space and its performance and harmony in its effectiveness for the child and the feeling in the contrast of the lighting colour from the ceilings and walls that contain natural lighting depends on the fact of its utmost importance by users psychologically because it leads to our performance of functions.

- The concept of innovation and correct decisions in mental development depends on the connection with the actual and intellectual aspects that push it to adopt new ideas and solutions in developing the organizational structure about the stereotypical and traditional thought that characterizes the individual's style.

References

[1] 1Si, S., H.J.J.o.E. Chen, and T. Management, A literature review of disruptive innovation: What it is, how it works and where it goes. 2020. 56: p. 101568. https://www.sciencedirect.com/science/article/abs/pii/S0923474820300163

[2] Bulturbayevich, M.B. Improving the mechanisms of strategic management of innovation processes in enterprises. In Archive of Conferences. 2021.

[3] Migdadi, M.M.J.J.o.B. and I. Marketing, Knowledge management, customer relationship management and innovation capabilities. 2020. 36(1): p. 111-124. https://www.emerald.com/insight/content/doi/10.1108/JBIM-12-2019-0504/full/

[4] Yu, T., et al., Digital Innovations in Interior Design: A New Model for Enhancing Indoor Spaces in Elderly Care Residences. 2024. 30(4): p. 3074-3086.

[5] Fernández, D.R.C., Distributed smart lighting systems: sensing and control. 2014. https://pure.tue.nl/ws/portalfiles/portal/3799294/774336.pdf

[6] Cheng, Y., et al., Design and application of a smart lighting system based on distributed wireless sensor networks. 2020. 10(23): p. 8545. https://www.mdpi.com/2076-3417/10/23/8545

[7] Malkin, J., Medical and dental space planning: A comprehensive guide to design, equipment, and clinical procedures. 2014: John Wiley & Sons.

[8] Nakahira, K., et al., Effects of different light sources used for dental operating microscope illumination on the visual function of operators. 2020. 62(4): p. 363-371. https://www.sciencedirect.com/science/article/abs/pii/S1349007920301316

[9] Armfield, J.M. and L.J.A.d.j. Heaton, Management of fear and anxiety in the dental clinic: a review. 2013. 58(4): p. 390-407. https://onlinelibrary.wiley.com/doi/full/10.1111/adj.12118

[10] Ma, S., et al., Retrofit design and operation strategies for dental clinics with optimised indoor thermal comfort, energy consumption, and life cycle cost. 2024. 81: p. 101510.

[11] Aries, M.B., et al., Daylight and health: A review of the evidence and consequences for the built environment. 2015. 47(1): p. 6-27. https://journals.sagepub.com/doi/abs/10.1177/1477153513509258

[12] Nabillah, S., et al. Empowering the Smart Lighting System in the Office Rooms to Enhance the Worker's Productivity. in 2022 4th International Conference on Cybernetics and Intelligent System (ICORIS). 2022. IEEE. https://ieeexplore.ieee.org/abstract/document/10031323

[13] Sundell, J.J.I.a., On the history of indoor air quality and health. 2004. 14.

[14] Kellert, S.R., Building for life: Designing and understanding the human-nature connection. 2012: Island Press.

[15] Devlin, A.S., C.C.J.H.o.e.p. Andrade, and q.o.l. research, Quality of the hospital experience: Impact of the physical environment. 2017: p. 421-440. https://link.springer.com/chapter/10.1007/978-3-319-31416-7_23

[16] Al-Araimi, M.A.H.J.J.o.t.A.i.A.R., The Role of Strategic Planning in Achieving Environmental Tourism Development (A Case Study on Hotels in Sur, Sultanate of Oman) p. 833-841. https://journals.ekb.eg/article_328900_0.html

[17] Küller, R., B.J.E.S.R. Mikellides, and P. Issues, Simulated Studies of Color. 2013: p. 163. https://link.springer.com/chapter/10.1007/978-1-4899-1140-7_7

[18] Kwallek, N., et al., Work week productivity, visual complexity, and individual environmental sensitivity in three offices of different color interiors. 2007. 32(2): p. 130-143.

[19] HUSSAIN, S.S., et al., Effect Of The Norms On Islamic Architectural Decision Making. 2024. 19(3): p. 926-940.