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Interactive Design of Pediatric Hospital spaces

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Abstract— Interactive spaces are seen as an important to enhance the healing process.The current study aims to discover interactive elements, which could be applied in waiting room in pediatrics hospital to enhance the healing process. The main question of this research is can interactive space in hospitals improve the healing process? The aim is achieved through (Literatures highlighted on interactive and healing and Case study on international examples).Describtive approach was used to deal with chosen examples, case study of lobby, hall, corridor, and various facility spaces- are concentrated in international hospital which are Nationwide Children's Hospital and Ann, Robert H. Lurie Children's Hospital and Hospital of Children's New Lady Cilento in Australia. The findings in this research are support user contact for social and information sharing through activities such as leisure, sports, strolling, and family visits. Flexible furniture shapes and arrangements, sculptures, lighting, and visual openness, as well as other services, may all contribute to increased user pleasure and therapeutic benefits. Conclusion of the research paper are the inclusion of interactive elements in open space in the design components helped to the establishment of a physical environment for users' psychological and social recovery, as well as to the mutual contact of users, and to the formation and social support of healing facilities.

Keywords— Interactive space, interactive design, Healing process, Healing Environment, Psychological Healing and Social Healing.

1. Introduction

Until recently, hospitals focused solely on: skilled medical staff, nursing specialists with distinguished skills, advanced medical equipment, and effective systems for serving patients and their families.

But what is new in today's hospitals is the tendency to pay attention to the hospital space, which allows patients to interact with the internal space, enjoy nature, and feel comfortable and happy, which reduces the pain of illness and treatment, stress reduction, and then speeds up recovery.

These proportions were selected so that they would remain consistent for both patients and waiting room guests. Wall, roof, light, and entertainment are all elements to consider when designing hospital waiting rooms with an interactive design conceptual perspective. Users' comfort in waiting rooms is related to the material circumstances that are conveyed by the mind and senses to the space's users in order to create an enjoyable environment for the examiners. Lastly essential components of relaxation are included in the interior space design of emergency lobbies: eye appeal, and stress reduction.

Individuals in waiting room areas benefit from interactive space design. It relieves boredom and monotony. One of the finest treatments for waiting rooms is the usage of interactive design. They are made especially to use sensory sensors to detect human needs in the surroundings and produce intelligent environments that are dynamically responsive. The aforementioned begs the question of whether interactive design may contribute to hospital lobby interior design in a positive and aesthetically pleasing way [6].

Statement of the Problem We discovered research that dealt with interactive design, as well as studies that dealt with architecture and healing environment. In order to

identify the knowledge gap, related studies should be followed.

Study by Elaine Biddiss, dealing with testing and design of interactive hospital settings to fulfill the requirements of waiting children. It is stressed in hospital settings that waiting can be stressful for children and their accompanying family members. Positive diversion opportunities have been demonstrated to lessen waiting anxiety, resulting in better health outcomes. The goal of this study is to create an innovative interactive media display in a pediatric hospital clinic waiting room that answers the rising demand for accessible, contact-surface-free play choices [9].

Other research indicate from a technological aspect, cure is a patient-centered, spiritual, mental, and empirical operation, whereas mending is a high-touch process, and the patient must get knowledge integrating these ideas [24].

Studies by Fenwick dealt with hospital design in interaction-Interactivity in hospital design: Offering a predetermined, ideal solution predicated on the idea that future hospital responsibilities are known to exist and will manifest at a particular moment in time.-Using solutions which are up to date with the times, and welcoming transformation, innovation, and ongoing change.-Including the components required for interactive designs, such as control, change in space, and movement, which provide more flexibility in adapting to changing conditions and managing the design of the structure's environment.-Creating dynamic surroundings, reactive architectural elements, and engaging spaces by utilizing movement as a basic element of interactive design. -Resulting in major energy savings based on technology developments, lowering dependency on fossil fuels for energy, and increasing that of renewable energy sources [10]. Therefore, it is clear that interactive design serves to fulfill the needs of unexpected as well as anticipated changing conditions, something that traditional designs are unable to accomplish.

Study by Paul, about what is an Intelligent Hospital, A place where technology and design converge to enhance patient care, this research addressed the concept of the smart hospital by employing smart technology in all hospital spaces and its impact on treatment, but it did not address the interactive space design or elements [12].

Mohamed highlighted on level design interactive of children's hospitals reveal that hospitals incorporate staff in design at various stages: The relationship between the designer and the design procedure is the first level. At this stage, the designer can pinpoint the crucial ideas needed to create engaging spaces that satisfy customer needs and more cozy hospital waiting rooms. The interface with the user and the design process is the next level. This stage comprises the user's inter-action with the environment on a physical level, their ability to adjust and react to it, and their feeling of balance with the area [17].

Study by Jeng provides an overview of interactive architecture relating to the design and implementation of ubiquitous computing technologies. Interactive Architecture Spaces that Sense, Think, and Respond to Change. The research in this study dealt with how to extract the main problem which is no enough Methods and techniques for developing such capabilities are described according to the model of interaction [14].

The previous researches, examples and a review of applications of computing technologies and their impact on interactive architecture were presented, but it did not address the interactive design or elements. Thus, the research problem is the cognitive deficiency in interactive elements, which could be applied in waiting room in pediatrics hospital.

This study's framework addresses the literature review, case study, methodology, results, and conclusion.

2. Terminology

This section is to give an entry to the interactive space, healing and interactive design, which represents the knowledge base about the main keywords of the research.

2.1 *Pediatric Hospital*

Pediatric hospitalists are pediatricians who practice primarily in hospitals. They care for children in a variety of hospital settings, including the pediatric ward, labor and delivery, the newborn nursery, the emergency department, the neonatal intensive care unit, and the pediatric intensive care unit. It collaborates with your child's regular pediatrician, as well as other physicians and clinicians involved in their care. If child's condition changes dramatically. When a child leaves the hospital, a pediatric hospitalist will provide a review of their stay as well as comprehensive instructions for any additional care that may be required [7].

2.2 *Healing*

The healing environment idea is used helping in the resolution of societal issues and needs by delivering both psychological and social healing in addition to physical healing care to consumers. Shin Yun-Jin stated that the Greek term 'Holos' means healing and that it is a source of wholeness, health, and holiness. Healing implies that the condition of harmony within and outside is shattered and that it returns to a harmonic and full state [25].

2.3 *Interactive design*

Interactive means is a process in which two or more interacting subjects perform a sequence of interrelated activities. Interaction is defined by reciprocal reaction, a connection, and mutual change. These issues alter or vary regularly in the context of interacting subjects during the interaction [13].

Interactive space: The term interactive space is concerned with interactive interfaces between humans and computers. A building is an enclosure that defines the boundaries of a space to support varied activities. Enclosures such as walls, floor, and ceilings can be considered as interactive interfaces. Other terms sometimes used for aspects of intelligent and interactive environments include 'responsive architecture', 'intelligent buildings', and 'smart home'. These aspects define architecture as a dynamic shape-shifting building system that is susceptible to alter its shape and physical properties in response to environmental conditions and user activities [11]. Interactive space: is not just responsive or adaptive, but it is space built on the basis of the idea of multi-directional dialogue. It has been known from its inception as the art of construction for the relationship between the parts of the building and construction for the relationship between the occupants and the structural elements of the building. Originally, interactive space depends on the capabilities of digital systems in the decision-making process, about the environment surrounding us and in which we live and how to influence it [21].

The concept of interaction pertains to the exchange of ideas between individuals and their surroundings. The components of a system that work together to make an environment more effective, pleasurable, and responsive are always an influencer and an influenced, an action and reaction, an activity and response, an action and answer [13, 22 and 16]. However, the current research define the interactive design in hospital it is the psychological relationship between humans and interactive elements, which contribute to the speed up of healing process through a group of interactive space indicators.

3. Interactive space elements

Interactive space characterized as areas and items with the ability to physically rearrange themselves to accommodate shifting demands [11]. Vefik, classifies interactive space into: The physical space, which can be measured and defined in terms, engineering ideas, the behavioral space and refers to the way people move within the space, and the experimental space in which it can be perceived and done, which is perceivable and in which experience is gained by the view-ing and arises from the apparent formation of activity and the spatial education of the visual field [2]. The interactive space elements and their components are classified according to [8] and [3] are physical and visual as follows:

3.1 *Physical elements which contain of;*

- ***Interactive Wall***

An interactive wall feature comprised by hundreds of fibers which respond to a viewer's presence based on a connection between electronic sensors and ventilators. Wind 3.0 moves with the viewer when there is a lot of activity the wall makes large fluid motions, while in other circumstances the fiber animation resembles a soft breeze. In this way, a direct relationship is made between human behavior and sculptural dynamics. Developed by Netherlands-based Studio Roosegaarde, Wind 3.0 plays with the similarities and differences between nature and technology, as shown in figure 1.

Figure 1: Interactive Ceilings

The "bubbles" work with a system above that can flow air in the bubble to open or enclose a space. When there are no visitors, "bubbles" understand the situation through sensors, and go back to their maximum shape. As shown in figure 2.

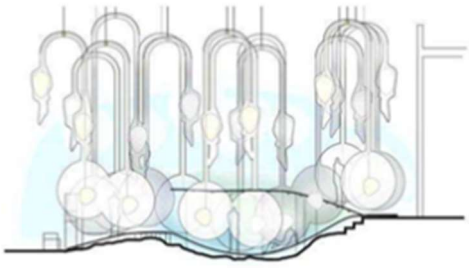

Figure 2: interact with people by creating spaces

Source; http://www.interactivearchitecture.org/bubbles-interactive-pneumatic-environment.html

This installation can be imagined further as a space or a building that have the same abilities to interact with its user. Architects at this stage are designing small scale

installations or components to see how it works, like an experimental stage of design [11].

- ***Interactive floor***

This work can be used as an example of WizeFloor, an interactive learning floor developed in. It incorporates movement, play, and learning into a floor-based interactive experience. Our app makes it easy for both children and adults to create new material. Its goal is to incorporate movement, play, and learning into an often inactive lifestyle, as well as to make learning more social, motivating, and enjoyable. The floor provides a wide range of activities specifically developed for the floor, see figure 3.

Figure 3: interact floor

Source; https://wizefloor.com/what-is-wizefloor

- ***Interactive Furniture***

From a functional perspective, furniture in the waiting room is crucial to creating a relaxing atmosphere. In addition to adding aesthetic value and decorating the interior space, furniture also gives residents a sense of comfort and serves as evidence of human habitation in the space [4]. Is an essential component that benefits our bodies by making us more comfortable, enhancing the interior environment, and adding visual appeal. When equipment meets users' needs for comfort and ease of use, it serves two purposes: it provides physical delight and evidence of human presence in the space [5]. The term "interactive furniture" refers to furniture that uses technology and smart systems to interact with the human body and requirements. We'll examine a handful of the several applications for interacting furniture in interior design [20]. The table's interactive system, which consists of a projector and a red beam linked to the primary controller's computer, allows users to interact with it just by touching its [26] .see figure 4

Figure 4: Interactive table

By selecting interactive chairs that respond to the body's needs, bad sitting habits that lead to physical issues may be avoided. The interactive chair can adjust to the form and size of the user and is programmed to maintain numerous sizes for different users. It can also send an alarm if the user sits incorrectly, encouraging him to rectify his posture. As shown in Figure 4, this is achieved by distributing sensors across the back and seat of the chair. In order to precisely identify the person seated in the chair, technology is employed.

Figure 5: Interactive chairs

This particular sort of furniture is made to serve multiple purposes and satisfy the needs of its customers. Additionally, it frees up space in small areas, which reduces furniture crowding. We discover that one of the intended purposes of built-in furniture is to enable people to enjoy themselves while residing in a small, constrained environment.

- ***Interactive Furnishings and decorative additions***

These kinds of uses include panels, sculptures, and water fountains that recognize interaction as a sensitive and important component that keeps users entertained and out of boredom while they wait. For example, the concept of interactivity may be applied to provide and show medical educational videos within humorous images [27]. Because using these applications enables users to utilize time in interesting and collaborative ways while waiting rooms,

people's minds can be expanded. Additionally, distributing the use of these apps across various domains increases their visibility to users, giving them greater power and depth [28], showing Figure 6, this interactive bench lights up with your tender touch.

Figure 6: Interactive Furnishings

https://www.homecrux.com/this-interactive-bench-lights-up-with-your-tender-touch/70812/

- ***Interactive Materials***

Noise-reducing ceiling panels and tiles decreased noise levels and the perception of sound reverberation durations, improving speech understandability, improving patient outcomes, and lowering staff work stress [15].

When flooring and furniture covers are made of readily cleaned, nonporous materials, the incidence of contact infections is decreased. Using warm fabrics also enhances social connection and a sense of control. Carpeting extends guests' stays in comparison to vinyl flooring [23].

Material elements form the foundation of hospital spaces; as a result, the walls, ceilings, and columns are hidden. Children are drawn to the furniture and furnishing, which adds aesthetic ornamentation or enrichment to the area while also stimulating the senses and providing visual pleasure and evidence of human habitation [19]. Super Cilia Skin is a tactile and visual system inspired by the beauty of grass blowing in the wind. It has ability to replay dynamic gestures over time and to communicate remote gestures.as shown in figure 7.

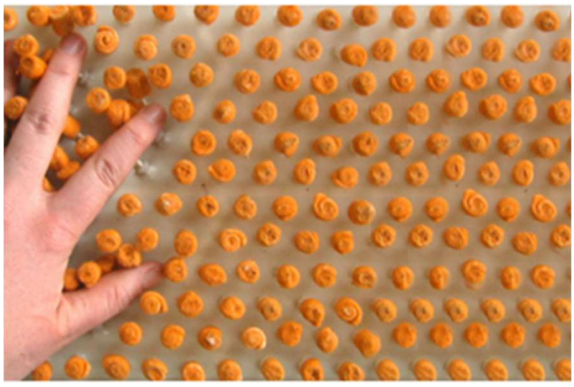

Figure 7: Super cilia skin. Source; www.angible.media.mit.edu

3.2 *Visual elements which contain of;*

- ***Interactive Lights***

To enhance visual comfort, industrial and natural lights are employed. The Dune Project projects a vision of a techno-centric nature and its creative application within public space. Viewers look at, walk around, and interact with a large, undulating field of light-emitting tubes. Designed by Studio Roosegaarde, Dune is an interactive landscape which responds to the location and behavior of people. This natural-technological hybrid is represented by large numbers of fibers that are brightened according to the sound and motion of passing visitors. Studio Roosegaarde completed a recent installation of Dune which is 40 meters long and filled with interactive lights and sounds, hundreds of fibers, LEDs, sensors, speakers, interactive software and electronics, shown in figure 8.

Figure 8: The Dune Project, Source: Studio Roosegaarde, www.studioroosegaarde.net

- ***Interactive Colors***

May be seen in an interior in a variety of ways, such as the way the light is composed and how the walls, floors, and furniture are finished. Four characteristics apply to color stimulus: intensity and brightness (quantity of radiant energy present in the color range), luminance (observed luminosity), hue (dominant wavelength), and saturation determines the vibrancy of the color [1].

Colors have a psychological influence on people who utilize space. Cold colors, for example, convey comfort and relaxation, while hot hues, on the other hand, convey life and warmth. One may determine which color influences interior design the most [18] as follows: - Affecting the visual nerve, which in turn affects the parts of the brain linked to emotional or physical activity, is the physiological effect of color. - It is the main function of color to draw attention, and it is achieved by a variety of color effects interacting with the general shape of the design (color gradation and contrast). - The psychological impact of color on users of space: how it creates emotions and affects their psychological states.

4. Methodology

The methodology that used in this paper is comparative which we dealt with descriptive of chosen examples, for answering the main questions of can Interactive space in hospitals improve the healing process? By providing an answer, this study will be able to add to the body of knowledge on hospital architecture and surroundings that promote healing across cognitive domains. Aim and objective in this research to discover interactive elements, to could be applied in pediatrics hospital waiting room.

5. International hospital

5.1 *New Lady Cilento Pediatric Hospital;*

Lady Cilento Pediatric Hospital is located in Brisbane. The hospital serves patients from all across Queens-land with tertiary and quaternary health services. It is a pediatric teaching hospital. The 95,000 square meter hospital spread across twelve stories is a noteworthy new urban development in Brisbane's Southbank area. As shown in Figures 9.

Figure 9: New Lady Cilento Children's Hospital, https://www.archdaily.com

Interactive design objectives, numerous studies have been conducted in Features that demonstrate the positive effects of nature, daylighting, and fresh air on healing. As a result, many medical facilities have ventured into "greener" territory by installing green roofs, extending patient rooms' windows, or creating gardens or walking paths on campus. The design of Rooftop Gardens includes a sloping green roof and enough for eleven rooftop gardens. Accessible Balconies In addition to the rooftop areas, many balconies at the termini of the public circulation routes on several levels provide pa-tients, family, and staff with views of the surroundings and a breath of fresh air. Design strategies that have been shown by research to directly support patient health and well-being are incorporated into the interactive features using a "salutogenic" approach. These strategies creating a green and healthy environment for patients and workers, as well as providing vistas of nature, connections to the outside world, and simple navigation are some of these tactics. as shown in Figures 10.

Figure 10: Main lobby of hospital

The idea of an interactive living tree forms the basis of the design concept. From the layout's two core vertical atria, or trunks, a system of double-height sections, or branches, extends. The branching spaces offer a network of external balconies and framing portals that allow people to interact with the city by going beyond the boundaries of the streets. Every branch is facing a significant feature in the neighborhood. In addition, the branch spaces let natural light into the structure and facilitate interaction connections between the interior and outdoors as shown in figure 11.

Figure 11: Main reception and Access to green space

The hospital's therapeutic environment includes vistas of adjacent parklands, interactive green walls, enclosed courtyard gardens, and rooftop gardens. In addition to being employed as a component of the hospital's rehabilitation programs, patients, family, and staff enjoy

passive and active enjoyment on the interactive green roofs located on the higher floors.

Two and three-dimensional in nature interactive art to enhance patient wellness and give younger patients entertaining diversion. The hospital's interactive public rooms are adorned with wood panels with pictures of bugs, beetles, and butterflies, and a group of vibrantly colored parrots as shown in figure 12.

Figure 12: Three-dimensional interactive art

Furnishing components in pediatric hospital settings achieved varied degrees of beauty, functionality, and adaptation to user needs. Waiting rooms feature chairs with more fluid designs, all of which are ideal for the space's principal use waiting. Leather was the main material, and premium materials were used for frequent washing and sterilizing. Bright and more captivating colors are used in the development of the furnishings, especially for youngsters, in keeping with the hospital's design idea, as shown in Figure 13.

Figure 13: Waiting room furnishings

The hospital is divided into two atriums that act as interactive visual connections between floors and vertical cores. One at each end artwork brings life to the timber-veneer surfaces next to the elevator lobbies.

The room was given space and improved spatial openness through the use of interactive light hues. Harmony between the hues of the furniture, floor, and ceiling was created by color selection. Overall, the distribution of industrial lighting was good; users of the area were not bothered nor blinded by it.

5.2 *Interactive in Hospital of Ann & Robert H. Lurie Children's;*

The 23 stories high, in square feet, 1,255,000 Children's Hospital of Chicago, Children's hospital of Ann and Robert Lurie, originally known as Children's Memorial Hospital, was designed by Anderson Mikos Architects Ltd., ZGF, and Solomon Cordwell Buenz. The Lean methodology promotes efficiency throughout the whole medical system, and this project is LEED Gold® certified (Lean management in health care website).

Hospital design and stress levels in hospitalized children and their parents are being studied at the Crown Sky Garden by a pediatric clinic on Chicago's Magnificent Mile in partnership with the clinic for Health Design. (American Society of landscape architects website).

Through direct interaction, children stimulate the garden and choreograph natural noises throughout this greenhouse environment. This garden, housed behind the glass green home is characterized by several touch-sensitive light and sound elements embedded in the vibrant resin walls and locally used wood elements. The Lurie Children's Hospital, a member of the Pebble Project, a collaboration of 50 institutions globally, is now using the Crown Sky Garden as a case study to better understand the healing advantages of these garden spaces.

Both the tree house on the twelfth story and the main garden on the eleventh floor were carefully designed to achieve various programming goals. These included following the tight guidelines set by the infectious disease control board to ensure a secure environment for children with compromised immune systems, giving inpatient children access to natural materials and light, and giving them the opportunity to engage with Chicago's rich historical and natural surroundings. At least 40% of the resin panels used to construct the integrative light walls are made of recycled materials. Bamboo Groves and Light Wall: The colorful wall is made up of many bespoke eco-resin panels that interlock and fold to change color from aqua to saffron. As people wander around the walls, the gradated colored panels provide a chromatic color flow and serve as an efficient antimicrobial surface. Children may interact with the sensors to trigger the led lights inside the retaining walls in the garden center, which changes the appearance of water as it flows from peaceful tide patterns to vibrant bubbles.

Marbles and Water: A bubbling fountain that erupts creates a striking color palette that comes to life at night with light coming from the plants. Goldfish and blueberry freeze are among the multicolored patterns created by hand-stacking and arranging the glass marbles. The

bubbling experience creates an interactive sound barrier that frames these two reflected sections that border the main garden. Garden rooms feature wooden sculptures that serve as both seating and play components. Each log has layers of resin that are lit from the inside, producing lighting chairs that may be used at night. Bronze hands cast from children's hospital patients are the sensors that activate the interactive water sounds emanating from the speakers cut out of the salvaged logs.

Founders Tree House is a private area reserved for inpatient children with severe immunological deficiencies that prohibit them from using the main garden. It is framed by a bamboo canopy from the garden below and is located on the 12th level above the main Sky Garden. The wood panels encircling the glass walls allow printed images of the sky, birds, and vegetation to peep through, as shown in figure 14.

Figure 14: Children's hospital of Ann and Robert Lurie

The Sky Garden at Crown, an indoor gardening that mimics an outdoor garden and assesses how well hospital environments work as healing tools, is available for patients and their families to unwind in. It is connected to the new building by bridges and features light, sound, water, and wood elements.

The transparent interactive light wall changed color and brightness as people approached it, weaving around the garden at various heights. Additionally, the area was split by environmentally friendly bamboo planters, allowing for both energetic usage and quieter relaxation.

Families may enjoy the amazing perspective of the city while gazing over the bamboo tree canopy and the Crown Sky Garden thanks to the Treehouse, which looms over it. The Kenneth & Anne Griffin Emergency Care Center's aquarium, which is located next to the garden, is a peaceful exhibit of beautiful aquatic life that is visible from the wall's two sides. It might be helpful for the kids there (Ann and Robert Lurie hospital of Chicago website).

Hospital layouts' functional elements were thoughtfully planned and came from the professional areas of the business, which included corporate workplace designs and academic and research facilities. Medical offices include dependable office equipment and neatly designed furniture that may be wall-mounted or mobile to provide for flexibility in the team area. These choices enable fast reconfiguration without interfering with architectural elements such as flooring. Architectural walls were not as necessary thanks to the soundproofing and half-height partitions, and the removable glass barriers are embellished with printed graphics for vibrant, full-color distinctive branding as shown in figure 15.

Figure15: Children's hospital of Ann and Robert Lurie

5.3 *Interactive Interactive Organic Components in Hospital of Nationwide Children's;*

The Columbus location of Hospital, Ohio, extended the use of healing gardens for the area around them and the entire on-site medical center. In collaboration with the hospital architects, FKP, the design company MKSK/OLIN team integrated the tower with the surrounding landscape in a holistic manner, creating almost Six acres of parkland, gardens for therapeutic purposes, and the hospital's surrounding campus. The additional landscaping area expanded Livingston Park's original 9.3 acres, giving the hospital campus a continuous boundary and an environmentally stimulating setting in a park that serves as both a neighborhood amenity and a therapeutic garden (Wikipedia website).

The design's objective is to establish a visual connection and a feeling of consistency between the interior and outdoor spaces, as well as between the inside and the rich natural materials and plants outside. The concept is "A Hospital in A Park, A Park in the Hospital," therefore natural wood textures and animal images that evoke a sense of being outside are used throughout the interior. The user was continuously connected to the outside garden via the inner hallway, which created a strong visual relationship to the outside. The building of the front lawn of the school provided six acres of new greenery, complete with a smell maze, walking trails, serene gardens, and a storyteller's nook. The new 6-acre children's park is designed with the advantages of raising their families, their doctors, and their neighbors in mind. The hospital's dedication to providing healthcare was demonstrated by the lawn, which also served as a fun new hangout for nearby residents, families, and patients. Young patients

may enjoy a succession of therapeutic gardens, which also feature a moonlight garden with a terrace and a central, shaded sitting space perfect for storytelling. Visitors approach the hospital through a two-story atrium that is well lit, offers views of the surrounding gardens, and has an interactive play area with a forest motif (hospitals magazine website).

The natural motif, which was developed in collaboration with Ralph Appelbaum Associates, is now used as a visual branding component all around the campus. All floors of the hospital include life-size wooden creatures that symbolize the design idea, while a vibrantly colored pattern of natural components unifies the interior and outdoor areas. The facility's patient rooms, which are around 300 square feet in size, offer plenty of area for relatives to remain with patients. Patients may personalize their rooms using a color-changing LED light strip over each patient bed and magnetic paint on the walls. At night, all of the colors are visible from the outside, adding to the building's overall architectural beauty (bdcnetwork; building design construction website) As shown in figure 16.

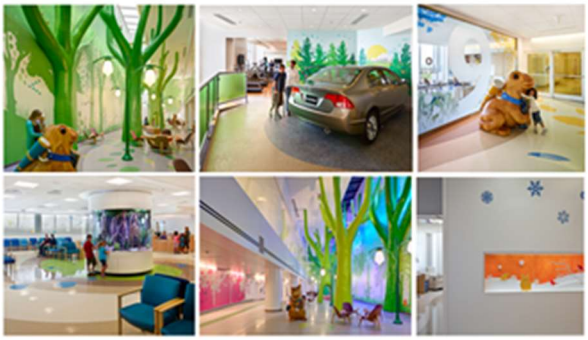

Figure 16: Nationwide Children's Hospital

Table 1: comparative in interactive elements

Hospitals / Interactive Elements	Hospital of Ann & Robert H. Lurie Children's	Hospital of Nationwide Children's	New Lady Cilento Pediatric Hospital	Outcomes on Children Healing
Interactive Wall	Interactive light walls are made of recycled materials.		Interactive green walls	Therapeutic environment and stress reduction
Interactive Roof			Installing interactive green roofs	Passive and active enjoyment.
Interactive Material	Interactive tree house's wood flooring and wood log seating pieces are made from locally salvaged wood with organic, non-toxic treatments.	Interactive images of animals and the natural wood textures.	Leather martials and bright color more captivating used in the development of the furnishings	Organic, non-toxic treatments with attractive samples.
Interactive Lights	Interactive light and sound features embedded in the locally reclaimed wood and colored resin.	Interactive walls and a color-changing LED light screen above each bed.	Interaction connections between the interior and outdoors.	Children interact with sensors to control the LED lights inside the retaining walls and personalize their rooms using magnetic paint on walls.
Interactive Furnishing	Interactive wooden sculptures serve as both	Interactive wooden creatures		Energetic use and quieter relaxation.

	seating and play features in the garden rooms.			Friendly environment.
Interactive Decorative additions	Interactive wood panels with printed images of the sky, birds, and foliage peek through as it envelops the glass walls.	Calm gardens, peaceful pathways, a chalk wall, and a storyteller's corner.	Interactive living tree forms the basis of the design concept. Interactive art.	Wellbeing and healty environment using interactive space, enhance patient wellness and give younger patients entertaining diversion. Also stress reduction
Interactive Color	Interactive color of panal change from aqua to saffron make up a colored resin wall.	The interior and exterior areas of the building are integrated by a vibrantly colored pattern of natural components.	Interactive color both inside and outside the structure. Interactive colored of bugs, beetles, and butterflies.	Wandering and mystry of color serve as an efficient antimicrobial surface.

6. Results and Conclusion

A set of summary findings, including the research processes, were produced by the analysis of the existing research procedures based on the analysis axes.

- The chosen furnishings and color scheme are what give the model's design its visual appeal. The model produces a distinct picture that enhances the assessment of waiting areas. We see that the model's lighting and furniture proportions are proportionate to the size of the area.
- The example included contemporary features, such as a well-balanced collection of forms and structures that correspond with contemporary advancements.
- A reasonable level of comfort in the waiting areas of the interior space was obtained in the design. While it was successful for the space's primary purpose of waiting, seclusion from other hospital spaces and the outside world was not attained.

- Due to the examples heavy usage of interactive art, excitement was comparatively accomplished.
- The color selections for the ceiling, floor, and furniture all achieved harmony and proportionality with the colors chosen for each room.
- The use of comprehensive lighting for the areas allowed for high levels of lighting to be obtained.

The foundation of design interaction is the exchange of information between people and their surroundings. Across ages, there are always influencers and influenced, actions and reactions that come together to form a coherent connection that can have either a positive or bad outcome. The potential for interactive elements rooms satisfies comfort needs thanks to integrated sensor devices that track user movements and interactions within hospital walls. In the end, this helps to bring medical facilities back to life and enhance the therapeutic benefits through social interactions by acknowledging the needs of the many user groups who come and utilize the facilities.

As a result of this paper, the using of elements of interactive space design which are lights reduces the stress and arts it gives the recipient a feeling of relaxation, which we find in this research paper to be more effective in health institutions.

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عناصرالتصميم التفاعلي في مستشفى الأطفال

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الخلاصة – تهدف الدراسة الحالية إلى اكتشاف العناصر التفاعلية التي يمكن تطبيقها في غرفة الانتظار في مستشفى الأطفال لتعزيز عملية الشفاء. والسؤال الرئيسي لهذا البحث هو هل يمكن للمساحة التفاعلية في المستشفيات تحسين عملية الشفاء؟ ويتم تحقيق الهدف من خلال (الأدبيات التي أبرزت التفاعلية والشفاء ودراسة الحالة على الأمثلة العالمية). تم استخدام المنهج الوصفي للتعامل مع الأمثلة المختارة، ودراسة حالة الردهة، والقاعة، والممر، ومساحات المرافق المختلفة - والتي تتركز في المستشفيات الدولية وهي مستشفى Nationwide Children's Hospital ومستشفى Ann وRobert H. Lurie للأطفال ومستشفى Children's New Lady Cilento. تدعم النتائج التي توصل إليها هذا البحث دعم المستخدم للمشاركة الاجتماعية وتبادل المعلومات من خلال أنشطة مثل الترفيه والرياضة والتنزه والزيارات العائلية. قد تساهم أشكال وترتيبات الأثاث المرنة، والمنحوتات، والإضاءة، والانفتاح البصري، بالإضافة إلى الخدمات الأخرى، في زيادة متعة المستخدم والفوائد العلاجية. خاتمة البحث هي أن إدراج العناصر التفاعلية في الفضاء المفتوح ضمن مكونات التصميم ساعد على إنشاء بيئة مادية للتعافي النفسي والاجتماعي للمستخدمين، وكذلك على الاتصال المتبادل بين المستخدمين، وتكوين وتكوين اجتماعي. دعم مرافق الاستشفاء

الكلمات الرئيسية – المساحة التفاعلية , الراحة ,التصميم الداخلي ومستشفى الأطفال