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The Role of Interior Design in Directing Movement within Internal Spaces to Achieve Physical Distancing and Reduce the Spread of Coronavirus

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Abstract

Objectives: The current study aimed to know the importance of interior design and its important role in reducing the spread of the Covid-19, reducing its increasing prevalence in the numbers of infections, and working to take healthy design measures to deal with the pandemic.

Method: The study followed the descriptive approach based on the theoretical framework to show the role of interior design in setting more flexible design standards and keeping pace with the latest developments Construction and communication process in the internal spaces and creating a more comprehensive design environment, health and safety with sound functional measures through the application of standards of physical distancing that regulate the behavior and activity of users within the facilities and the process of communication in the internal spaces.

Results: The study showed several results, the most important of which was the role of interior design in interacting with the changes and challenges of the current era and enhancing the concepts of guidance and dynamic movement processes and their relationship in achieving physical distancing.

Conclusion: The study showed the effectiveness of achieving new alternatives and design ideas that reduce spread of Covid-19. The study recommended the importance of activating the role of movement paths through smart design, flexible design, and sustainable design in achieving physical distance that secures safety distances between users and limiting the spread of the Covid-19 virus.

Keywords: Flexible design; smart design; sustainability; Physical spacing.

دورالتصميم الداخلي في توجيه الحركة داخل الفراغات الداخلية لتحقيق التباعد الجسدي و الحد من انتشارفيروس كورونا

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ملخّص

الأهداف :هدفت الدراسة الحالية إلى معرفة اهمية التصميم الداخلي، ودوره المهم في التقليل من انتشار فيروس كورونا Covid -19 والحد من انتشاره المتزايد في إعداد الإصابات والعمل على اتخاذ الإجراءات التصميمية الصحية للتعامل مع الجائحة .

المنهجية : اتبعت الدراسة المنهج الوصفي القائم على الإطار النظري لبيان دور التصميم الداخلي في وضع معايير تصميمة أكثر مرونة ومواكبة آخر المستجدات والأوضاع الراهنة بسبب انتشار فيروس كورونا Covid - 19 و ايجاد بيئة تصميمية أكثر شمولية صحة وأمان ذات تدابير وظيفية سليمة من خلال تطبيق معايير التباعد الجسدي التى تنظم سلوك ونشاط المستخدمين داخل المنشاءات، وعملية التواصل والاتصال في الفراغات الداخلية .

النتائج : أظهرت الدراسة عدة نتائج كان أهمها؛ دور التصميم الداخلي في التفاعل مع متغيرات وتحديات العصر الحالي، وتعزيز مفاهيم عمليات التوجيه والحركة الديناميكية، وعلاقتها في تحقيق التباعد الجسدي.

الخلاصة : بينت الدراسة فعالية تحقيق البدائل والأفكار التصميمية الجديدة التى تحد من انتشار فيروس كورونا Covid -19، وأوصت الدراسة بأهمية تفعيل دور مسارات الحركة من خلال التصميم الذكي والتصميم المرن و التصميم المستدام في تحقيق التباعد الجسدي التي تؤمن مسافات أمان ما بين المستخدمين، والحد من انتشار فيروس كورونا Covid -19.

الكلمات المفتاحية: التصميم المرن، التصميم الذكي، الاستدامة، التباعد الجسدي.

1. Introduction

Due to the great changes and challenges and their differences in the social, economic and health levels that the world is witnessing with the emergence of the Corona pandemic, which contributed to changing the way we live and work through it, as it has become a major challenge and a radical turning point in various areas of life, this led to the imposition of communication restrictions, isolation, and widespread lockdowns that changed the features of daily life (Fegert et al., 2020). The COVID-19 outbreak, which is widespread around the world and in the Jordanian region, is one of the largest challenges trending nowadays (Alhmoud & Çağnan, 2023).

where this study came as a quick response and reaction on the latest developments in the spread of this virus to take the necessary measures in the face of all the obstacles faced by various sectors after the gradual return to normal life and to limit the spread of this epidemic. The study included a statement of the role of interior design, which is one of the fields of human sciences that contribute to serve society and environment in a large way through the presentation of design ideas that provide quick solutions that contribute to dealing with modern developments and adapting them in the service of humanity, where the specialization offers broad prospects in terms of dealing with Interior spaces and areas in form (aesthetically) and functionally (utilitarian) and work on organizing within the interior spaces for users in various residential, commercial, health and other projects. The specialization pays great attention to the use of motion paths, which is one of the terms of interior design, which has a great role in directing the behavioral pattern of users in the spaces. The motion paths and their multiplicity are considered within very important basic rules that organize the work, motion, and movement in a wide regularity in the interior spaces that achieve the physical distancing. And this research presents a study of the epidemiological situation of the pandemic and its consequences affecting humanity as a whole for non-compliance and adherence to the rules of physical distancing in a way that ensures limiting the spread of the virus, reduces the number of infections, and works to flatten the epidemiological curve. For that the study showed relationship of motion paths in the configuration of spaces and the indication of their effectiveness and types in the interior spaces and their impact on the achievement of privacy and personal space, adhering to physical distancing within effective spatial planning reduces the spread of the COVID-19 virus (Xiao et al., 2022: 13). The results of the study indicate that the Corona pandemic has contributed significantly to the need to re-examine the new human lifestyle, the speed of response, modern developments of the times, and to promote design alternatives that contribute to reducing the spread of the virus and creating healthier and safer environments, (Zaher,2020) and making physical distancing part of the designed equation in public life. The study showed the importance of paying attention to sustainable environmental design and smart design and involves it effectively, because of their great importance in finding radical solutions in interior design.

1.1 Research problem

The spread of the Coronavirus is one of the most important current challenges facing the world in all sectors in general and interior design in particular at this time, which negatively affects the attendance of all kinds of projects with continuous physical activity at the level of (residential, educational, health, commercial, tourism), and the freezing of human activity in it, and as a result of unhealthy direct contact between users of the spaces, the spread of the virus has increased significantly and noticeably.

The problem of the research lies in the lack of cognitive perception of understanding the importance of interior design and traffic paths and their importance and real role in interior design, which is important in achieving the actual balance in the face of the spread of Covid-19 and creating healthy environments.

1.2 Importance of the research

The importance of the study comes as a quick response and reaction for the gradual return to normal life in the facilities and to protect users from the spread of the Coronavirus Covid-19, hence the need for a study based on a design criteria and on a setting which is more flexible and standardized to keep pace with the latest developments and current conditions due to the spread of the Corona virus in proportion to the Social and economic conditions and a more inclusive design environment, review of the current reality of design and steering towards a healthier and safer successful future design. The importance lies in highlighting and improving the human health within interior design, based on role of motion paths in

interior design and its positive impact on users in various facilities, which achieves the principle of safety based on the application of Physical distancing.

1.3 Objectives *of the research*

- Evaluating the influence of interior design components on spatial circulation within enclosed environments.
- Developing strategies to regulate human traffic patterns to mitigate the transmission of airborne diseases such as COVID-19.
- Evaluating the efficacy of spatial configurations, furniture placements, and signage in directing individuals within indoor settings.
- Proposing design standards for architects and interior designers to tackle public health issues.
- Assessing the impact of materials, lighting, and air circulation systems on reducing physical contact and improving safety in indoor settings.
- Encouraging designers to explore design alternatives that enhance health outcomes and mitigate virus transmission.
- Attaining the capacity to adapt and coexist with contemporary developmental demands to foster a healthy environment and ensure secure internal spaces.

2. Research Questions

1. What solutions does interior design offer by using motion paths to find vital alternatives to reducing the spread of the coronavirus?
2. How can the interior design confront random behaviors within the internal spaces and give organizational solutions to the motion within them in a more organized way and achieve physical distancing?

3. Search Limits

3.1 *Spatial Boundaries: The Hashemite Kingdom of Jordan, Amman in public space (Educational, Entertainment, Commercial, and Health Care)*

3.2 *Temporal Boundaries: Studying the foundations and principles of design in interior design to achieve physical distancing at present 2020/2021*.

4. Research hypotheses

The subsequent hypotheses contain the primary questions of the research, formulated to yield quantified and verifiable predictions that correspond with the research objectives.

1. There is an urgent and important need to study the motion paths and their importance in defining the concept of physical distancing and its application in ensuring the behavior of individuals and commitment through it within the internal spaces.
2. The positive intersection of interior design with various medical and human sciences, the most participatory and interactive in addressing community issues in all fields and highlighting its effective role in finding appropriate solutions.
3. The research assumes that the interior design will not stand silent (helpless) in the face of exceptional circumstances, especially the spread of the virus, and it will be a major turning point in the process of modern future design in keeping with all developments and providing healthier and safer environments, production and achieving the welfare of users.
4.

5. Research Methodology

This study depends on descriptive approach based on a theoretical framework in identifying the theoretical foundations in the field of movement and motion paths in interior design, analyzing their types and their impact on the design output, describing their importance and role in enriching interior design with a new approach with future visions moving to a new

era in the world of design with the ability to responding quickly, absorbing challenges, developing radical solutions, relying on scientific and applied alternatives, with a statement of descriptive methods, through a brief review of current designs, implementing new ideas for multiple kinetic technology, and clarifying the principles of motion paths and the mechanism of using them correctly in the design of interior spaces.

6.Techniques used in the study (information sources)

6.1 *Analyze content by analyzing the characteristics, features and factors that made the motion paths a basis in achieving the desired goals through the available information, in order to reach the correct results*.

6.2 Previous studies

The current study closely examined the content of other studies that are closely related to the subject of motion and its paths in interior design, and included several studies:

1. The study of the researcher (Abdel Muttalib,2011) entitled Directing Motion Paths in the Interior Architecture Design for Public Establishments. The study aimed to use the elements of interior design to direct movement in constructions and identify the influences that contribute to the process of directing motion paths.
2. A study by the researcher (Helwa,2012) entitled The Evolution of the Concept of Motion and its Reflection on the Architectural Output).
3. The researcher study (Onay.N,2020) entitled (Change in the interior space and the concept of luxury in relation to the new Coronavirus). The study was interested in clarifying the integration and welfare mechanisms within the internal spaces of the users by activating the role of basic requirements in the space working system in interior design.
4. The researcher study Zaher (2020) conducted a study titled "Design Solutions for Interior Architecture Post Coronavirus (COVID-19)." The study aims to identify the significance of proposed solutions for interior spaces by utilizing digital technologies and leveraging natural resources, as well as how to effectively implement them.
5. The researcher study (Chugh, D., & Kaur, P. (2024) entitled an assessment of paradigm shift in people's priorities toward interior designing of space during the pandemic outbreak the study addressed the delineation of employing spaces within interior environments to achieve flexibility in usage according to the required needs in light of the COVID-19 pandemic.

7. The mechanism of activating the role of motion paths in the vital formation of the inner space

The spread of the Coronavirus, the pandemic of the modern era, is one of the pandemics that affected interior design and architecture, as it was affected throughout history by many pandemics and epidemics, such as the outbreak of cholera and others, and worked to find solutions to avoid and address all risks (Mason, 2021), where successful design plays a distinctive role in achieving a healthy system, whose positive role is reflected in the effectiveness and activity of users within the internal spaces, and the motion paths have a very great relationship in the effective biological formation within the spaces, and it is a group of interacting energies among them. Which affects the user as the first criterion in the success of internal spaces through their vulnerability, behavior, and interaction with all elements" From Shamaileh n study, he explained that interior design makes sure that there is a general relationship between the building parts of the interior, as well as a special relationship between all internal space and man, (Shamaileh, 2021).

that is, the motion paths are able to achieve and consolidate the concept of human considerations within the interior spaces, as Helwa indicated in her study on the movement of the individual user of the space is "the traditional motion of the individual who uses any architectural space to achieve the function of the building designed for it" (Helwa, 2012)

The interaction between users and space is shaped by permeability, which involves designing interconnected motion paths within the space. This design combines geometric and irregular blocks, creating spaces through addition, subtraction, and modification. Effective path design enhances spatial diversity and usability, making the environment more responsive and active. Diverse paths improve visual analysis and ease of access, impacting user perception. The type and arrangement of paths—straight, zigzag, or gradual—affect navigation and orientation. Successful design of corridors, elevators, and stairs with clear visual cues ensures effective spatial organization and user orientation, which is achieving flexibility

between the inter relationships between all parts of the interior space.

The motion paths achieve the principle of interaction of the interior spaces through:

A. According to the nature of the space and use

B. According to human activities and behavior

Motion paths have an important role in linking and achieving the principles of interconnectedness in design between internal and external spaces related to diversity, multiplicity and differences in the nature of their formation, especially in dealing with different forms of formation spaces (whether it is Central, Linear, Radial, Assembly and Network) based on the functional relationships between them and the area constituting the space and according to the nature of each space, whether public or private, as Al-Qanawati indicated in her study "We give the name to the space confined within its determinants where there are no openings and no movement of static space). Or the inhabitant" (Al-Qanwati, 2015)

The visual impression in projects strongly influences motion paths by helping users understand and navigate the space, decide on the correct path, and adapt effectively. Key factors in designing motion paths include:

A. Defining the nature, type, and relationships of motion paths for each space.

B. Designing dimensions and measurements for motion corridors.

C. Understanding how main motion paths relate to secondary paths and surrounding spaces.

D. Integrating horizontal paths (corridors) and vertical paths (elevators, stairs) effectively.

8. Clarify the effectiveness of motion paths and their types in the inner space

A good organizational preparation for the internal space and its components in terms of form and function achieves different uses and activities comfortably and works to provide internal spaces with real dimensions and good spaces with sufficient separation distances between its elements and components that increase productivity on the one hand and achieve physical distancing on the other hand, while walking between them without any specific obstacles to movement, the spread of the Coronavirus among users is affected by the type and nature of the building, the occupancy, its duration, and the internal human activity (Dietz&Horve, 2020) and these paths achieve guidance the natural flow of movement and movement within the internal spaces in particular and between the adjacent spaces in general, which works to find organizational design solutions in order to develop workflow and mobile solutions to accommodate the various functions and activities within the projects.

It requires the development of a spatial design and planning in which several aspects are taken into account, including the nature of movement and the paths of motion of its various types and forms commensurate with the functional requirements that must be met in the space, which gives a clear visual vision of the internal environment and facilitates the process of orientation, movement between the spaces or what is within them quite easily. Where the current conditions of the spread of this epidemic require resorting to a design that aims to find radical solutions in a space, take into account the quantitative and qualitative balance, investigating the (physical environment, space and social environment) to find the successful design system. As (Shamaileh) indicated that, the interior design is a reorganization of the formation and formulation of the interior spaces based on the functional and aesthetic needs (Shamaileh, 2021).

Movement paths secure functional determinants of activity, interaction within space and design parameters that take into account general needs and are to be provided, as well as organizational aspects that provide necessary precautions and secure public security and safety systems for users. These paths contribute to the introduction and granting of successful design flexibility, speed and performance of the task, whether they are motion paths private or public, depending on the nature of the users' work (staff, visitors, residents, and others).

Effective use of motion paths ensures health priorities and optimal service in a project. These paths, including vertical (elevators, stairs) and horizontal (corridors), are crucial for functional use and movement between spaces. Each path type—main or secondary, linear or curved—has a distinct character. Modern interior design incorporates reciprocal relationships with technologies to meet user needs, enhance comfort and safety, and reduce COVID-19 spread by maintaining physical distance. and (Brian Lawson) says in defining space: "It is that which unites us and at the same time separates us from each other (Lawson, 2001)

9. Movement paths and their relationship to achieving privacy in interior design

Privacy is crucial in interior design, affecting user behavior and interaction. It involves more than separation; it aligns with users' styles and interactions with the space. Motion paths enhance privacy, allowing freedom, safety, and comfort while regulating space use. They facilitate self-privacy, providing physical distancing without isolation. Design principles, including scale, human anatomy, and volume relationships, guide motion path creation to prevent contact and ensure effective physical distancing in interior spaces.

Issam Rajab defined privacy "that it means the need for individuals to carry out their various activities without monitoring or follow-up from others (Ismail, 2003) and privacy is divided in the Internal design into two types: -

1. Inner privacy: it is the separation between the spaces while preserving the identity of each space from the other with the possibility of achieving interconnection between them through the corridors and paths of movement.
2. External privacy: It is represented in separating the internal and external spaces and linking them through various motion paths in order to achieve sustainability and visual communication through raw materials (glass) through architectural openings.

Privacy is an efficiency in movement and use within the space that achieves different living needs and requirements freely and with great flexibility while providing isolation, whether visual or audio (Mohammed, 2008) and the motion paths achieve physical distance also depending on visual privacy, which is linked in Sight sense and interaction through vision, observation and follow-up within separating distances, which achieve dialogue, and through which readings of facial expressions and body language are carried out at varying distances between 30-60 cm.

And it works to find solutions directly without physical convergence. The correct motion paths provide points of convergence and communication based on the application of the concept of the personal bubble in achieving the separation between individuals according to the nature of the next place. The personal bubble is what provides comfort in the level of movement and performance of functions, and it is divided into three sections:

1. Intimate bubble 50 cm (for family relations)
2. Personal bubble 120 cm (for dialogue and group conversations)
3. Public bubble 300 cm (lectures, speeches)

9.1The importance of motion paths in determining personal space

Edward T. Hall was the first to define and explain the concept of personal space through his book (The Hidden Dimension) in the year (Hall, 1969), where the motion paths seek to achieve the correct equation in logical communication and not to harm others, that is, by the amount of privacy required is to be the least possible and to the extent that allows the use of place and performance of a function to the fullest extent, and the communication between individuals is through vision and hearing (Ismail, 2003: 3). The personal space is the area surrounding the user and is linked to relationships and the nature of relationships with others, whether (family, social, healthy, services, etc.).

Personal space limits the physical closeness between users and achieves the concept of physical distancing, that is the motion paths of work find a clear strategy in the ability to adapt and coexist with the Corona pandemic through distancing and respect for personal space, as Edward Hall defined. A personal space is the fake bubble that surrounds a human being and affects his behavior when someone else breaks into it. (Hall, 1969), and the motion paths work to give priority to personal space by making adjustments to the common spaces which contributes to changing the concepts of interior design in terms of awareness and education, meaning that the behavior of physical distancing has become a natural thing and an integral part of the design process and linked to human behavior, as Ferreira indicated, "The basic idea of social comfort comes from respect for personal space" (Ferreira,et al, 2020).

10. Motion Paths and directing the nature of movement within the inner space

The interior architectural design is a science that aims to serve the human being and to meet his various needs, and it must be based on the scale of the human being and its dimensions (Haider, 1998). It represents the personal environment, as the user's behavior and the activities in which he performs within the internal space give him a special identity in terms

of function and use. Movement paths are affected by the complementary elements that are distributed within the spaces such as furniture, accessories and others, which plays an important role in determining the orientation, direction of movement, nature of movement and motion path to reach the intended goal, so that movement is easy and regular, free of obstacles and clear vision, depending on the visual effects within the internal space, Motion paths in internal spaces are influenced by activities such as standing, sitting, talking, and resting. They rely on ergonomic and anthropometric principles to determine proportions, scale, and user interaction, aiming for effective physical distancing. Key aspects of motion paths include:

1. Space Utilization: How people occupy and move within a space.
2. Ideal Movement Conditions: Appropriate dimensions and scale for human movement.

The relationship between space size and user movement speed affects functionality and emotional response. Space shapes, whether regular or irregular, impact movement efficiency and interaction. Motion paths integrate private and public areas, influencing the design's flexibility and user navigation.

Motion paths depend on user volume, space design, and the interaction between open and closed areas. They are crucial for connecting spaces, guiding movement, and ensuring public health and safety. Effective design considers:

1. Movement Spaces: Their purpose and nature.
2. Activity Spaces: Their productive functions.

Motion paths organize workflows, ensuring obstacle-free movement and safety. They address congestion, guide internal space organization, and ensure safety in normal and emergency situations. Clear directional signs and visual symbols help navigate these paths effectively, and Brian Lawson believes that “no building completely devoid of symbolic content” (Lawson, 2001), and there are signs of an explanatory functional nature (indicative, emergency) where these paths are affected by the intensity, amplitude, and speed of movement, which have a significant impact on the decision to take the path, its nature and direction.

We do not overlook the importance of the psychological effect of colors in reviving the paths and corridors of movement through the determinants of interior design, floors, and walls through the component colors. It has, in addition to lighting of various patterns, and its positive impact on spaces and motion paths.

11. The importance of motion paths in activating the functions of internal spaces

Successful motion path design focuses on simplicity, easy perception, clear intersections, and variable directional permeability. It should follow a spatial and temporal sequence, aiding visual impression and mental clarity. This design must account for physiological, psychological, social, and economic factors impacting the functional environment.

These are considerations through which the operational function associated with human behavior and activity, which is the ability to respond and interact with the components and elements of the interior space, and what is called the symbolic function of functional flexibility, which is the ability to exchange and change spaces to accommodate different activities by changing the space in terms of composition and distribution of jobs and finding new activities on the basis of the available area (Al-Sabban and Al-Tayeb, 2020). The motion paths depend in achieving the operational environment on:

1. Number of users for space .
2. Type and nature of activities within the space.
3. Length of time taken.
4. Functional and movement requirements.
5. Health requirements (Public Health Wellness).

There are two types of motion paths according to the nature of the internal spaces designated for the job, including:

A. General motion paths for all users.

B. Special motion paths (restricted) for a specific category and according to the nature of the use of spaces.

12. The role of motion paths in achieving designed alternative

The human behavior, and his movement within the space as he occupies a place in it and it constitutes the motor activity within the internal spaces and the different nature of the movement depending on the activities and according to the function to be performed such as standing, walking, sitting and others, which are related in the field of vision and perception, whether the path of motion is horizontal or vertical, as Abu Zaarour indicated that "the behavioral space is the way in which people move within the space" (Abu Zaarour, 2013).

Motion paths are crucial for modern design, adapting to needs like limiting Coronavirus spread by offering flexible design solutions. This includes developing a design program and style that address user behaviors with humane and healthy dimensions. The design process involves:

- **Spatial Planning**: Structuring internal spaces and movement corridors for efficient and safe movement.
- **Movement Types**: Incorporating flat, multi-level, straight, circular, and curved paths to match the space's nature.

Design elements, including color, lighting, and furniture, affect motion paths. The interplay of horizontal (floor, ceiling) and vertical (walls) elements, whether regular or irregular, shapes the movement patterns. Proper design ensures continuous spatial flow and enhances interaction between internal, external, and virtual environments. The following diagram shows the stages of reaching the concept of correct physical distancing.

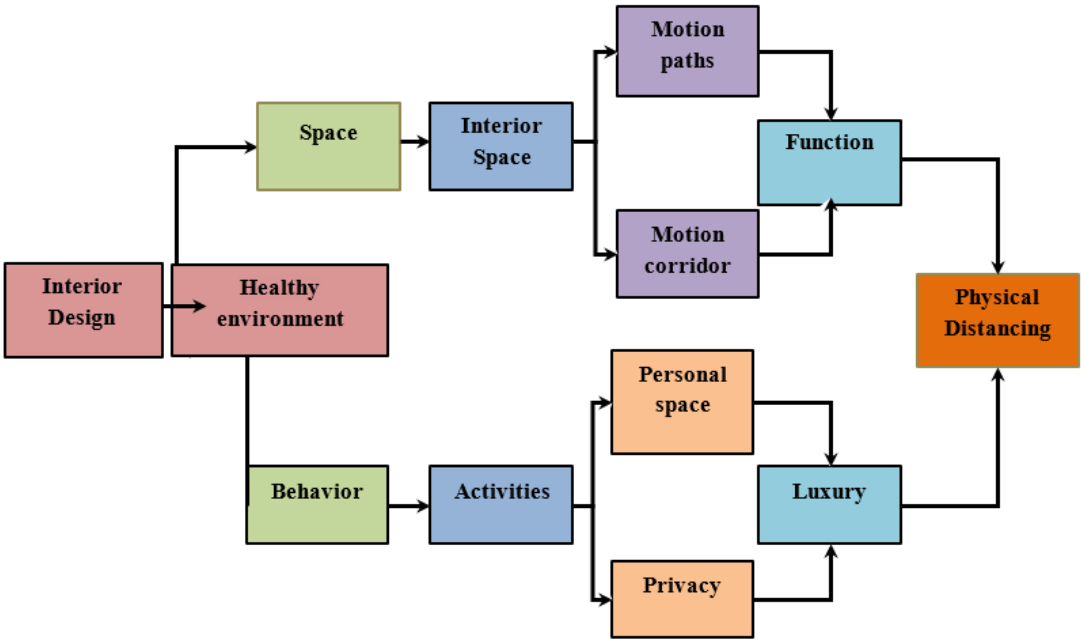

Figure 1: It illustrates the Stages of reaching physical distancing (prepared by the researcher)

13. The role of motion paths in flattening the curve and limiting the spread of the virus

The motion paths strategy is a mean of controlling and regulating the movement of users and communicating with each other in achieving the principle of physical distancing on the one hand and achieving containment of activities and events within the space on the other hand, it is an indicator of the proper assimilation of users by regulating the forms of motion corridors of different kinds. It represents the identity of the positive interaction between the user and the spaces, "and that prevention is the only approach and one of the available measures in controlling the spread of the Coronavirus" (Olaimat, et al., 2020) by providing important means, including providing information about the risk of spreading the virus and promoting positive attitudes through statement of the role and importance of physical distancing in maintaining public health.

Motion paths help reduce injury rates by minimizing direct contact and maintaining safe distances, such as 6 feet (1.8 meters). They are crucial for public safety and effective communication, particularly in light of the Coronavirus. Proper design of these paths, including horizontal and vertical movement corridors, reduces congestion and supports physical distancing, thus lowering the risk of infection.

meaning that one of the functions of the motion paths is to reformulation the spatial settings and behavior system through the spaces by consolidating and confirming the social requirements that achieve the welfare of the user and creating the appropriate atmosphere and climate in the healthy indoor environment to perform the various activities inside the space as indicated by Stamatina Th Rassia "Architecture should focus in developing and designing that is more human-centered in the future with the aim of achieving protection for him in the conditions of crisis" (Rassia, 2020) the importance and role of the motion paths lies in flattening the curve through:-

13.1 Paths of motion towards achieving sustainability

Motion paths promote physical and psychological health by linking internal and external spaces with positive energy, enhancing sustainability, and avoiding isolation. They improve ventilation, reduce infection spread, and ensure natural lighting, which supports user well-being. Effective design integrates these corridors to improve air flow and environmental conditions, addressing human sensory needs like ventilation, humidity, and temperature.

.as Onay pointed out, "It is possible to take into account natural ventilation, sunlight in closed places, and appropriate humidity, all of which are positive factors related to protection from infectious diseases" (Onay, 2020)

13.2 Motion paths and smart design

The motion paths have a pivotal role in the regular connection between the internal spaces and is based on upgrading the different methods in their application through the vitality of the different motion paths to contribute to improving and stimulating the nature of the internal environment in terms of communication and contact between users. So motion paths in smart technology systems need to be linked through the use of sensors with a sensing mechanism linked with the occupancy of the internal space based on the data, as it works to achieve integration among them by giving the spaces the basic criteria that reduce the spread of infection and virus among users, sensors are devices that have sensors through which windows are opened automatically in response to a group of special sensors in temperature, spaces occupancy and humidity (Wingginton, M, 2002).

Using spaces in a way that aims to achieve visual communication between inside and outside together without limitation is one of the successful tasks of motion paths by creating a space that is using to reduce the assembly process and give users communication with the outer space, as the balconies give one of the few opportunities to reduce isolation (Bereitschaft & Scheller, 2020),visual communication with nature and with others is achieved without the need for close distances between them, which leads to applying and establishment of the concept of dynamic design, which emphasizes the integration between human design and organic natural elements in a unique and realistic way. Adopting a method and introducing new ideas in the motion path, that reduces random interference, convergence and resorting to a radical change in the design system and its integration with smart design, "which is a rethinking of the modern human lifestyle and well-being "(Akroush, 2021).

13.3 Motion paths and flexible design

Flexibility means, according to Fadel's study, "the flexibility of the architectural plan and making it more sufficient to suit addition and change in the future and when required" (Fadel, 2011). The alphabet of motion paths is based on achieving the concept of flexibility in design by using flexible elements and more flexible spaces and creating corridors and spaces without obstacles with a modern, healthy language that is very sound. And that is represented in the establishment of new concepts in the design process and orientation to flexible design that works to find solutions and quick alternatives by changing spaces and dimensions and reaching the applicable motion away from the fixed design that creates a kind of inertia.

Flexibility means the possibility of structural functional expansion to suit the developments of the times and keep pace with future variables through the ability of spaces to disintegrate, separate and expand at the same time, and therefore it is only an actual re-evaluation of current projects and work on reading the ground and achieving new design alternatives such as working on creation new formations and spaces and adding other services aimed at moving from fixed to smart mobile design by creating new spaces and spaces in the so-called adaptive or kinetic architecture effectively based on modern technologies in design, Which achieves physical distancing and finding a safe distance between people that reduces the amount of near- and short-term physical interactions (Ugail et al. 2021, 2020)

13.4 The process of applying motion paths through simulation in interior design.

One of the priorities of using the motion paths correctly is to improve the internal environment and increase the desire for communication and interaction between users while ensuring independence and physical distancing at the same time. The motion paths seek to reshape the design life of the spaces, and it is only a means of reaction to re-evaluate and consider correcting spaces and distances and to propose new membership requirements that serve physical distancing and provide comfort and freedom in the movement of users and to accommodate new requirements that are in line with the current situation and provide a healthy, more vibrant and comfortable environment. The success of the motion paths in achieving the primary goal of physical distancing depends on the simulation and virtual reality system, which is the pre-design interaction to test all the elements and components of the project.

"Virtual reality technology is linked to the visualization of the design and the interaction of the viewer"(Ahmed, at al. 2020) and the simulation system is one of the future scenarios that are supposed to be expected before the implementation of the project, with this study the motion of users inside and outside the project, analysis of motion paths, treatment and avoidance of functional problems through physical or mathematical models through various graphic techniques (graphics, animated videos). The motion paths manage the spaces of the building by controlling the future variables of the spaces to achieve compatibility and flexibility based on speed of response and effectiveness, which has a clear impact on functional improvements in achieving safety and flexibility and achieving users' comfort in terms of emphasizing the concept of personal space and its impact on achieving physical distancing. Thus, the lack of commitment to the physical distance of a few meters may isolate us for long distances and from each other; the physical distance is a space and a safe distance to instill a feeling of comfort and reassurance.

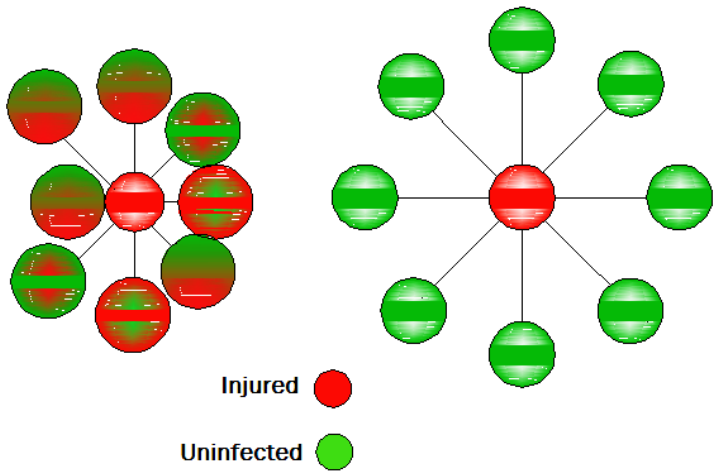

Figure 2: shows the role of motion paths in achieving physical distancing (prepared by the researcher)

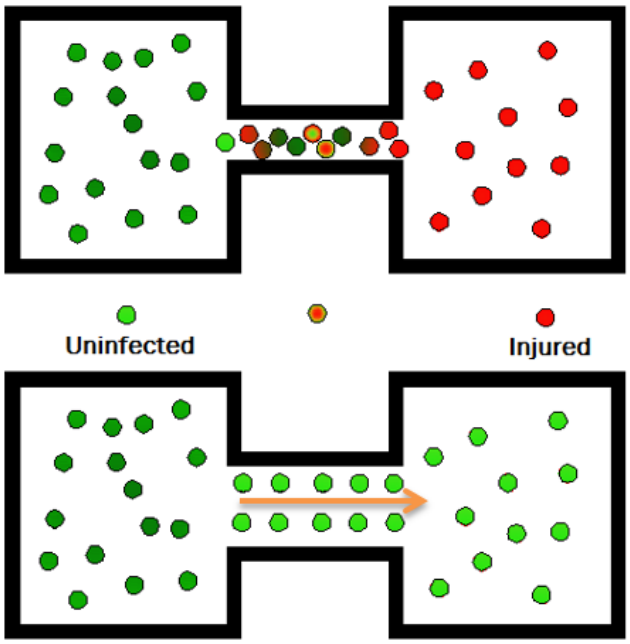

Figure 3: shows a mechanism for comparing the role of the motion path in achieving physical distancing, proposed 1 (prepared by the researcher).

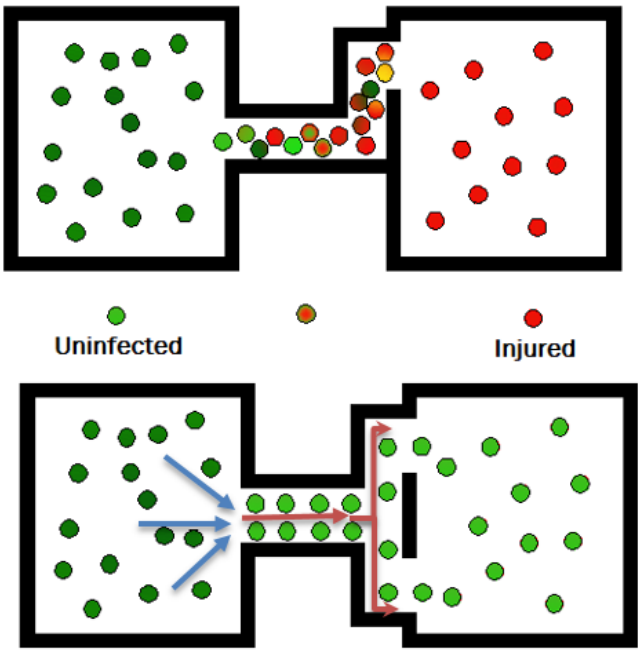

Figure 4: shows a mechanism for comparing the role of the motion paths in achieving physical distancing, proposed 2 (prepared by the researcher)

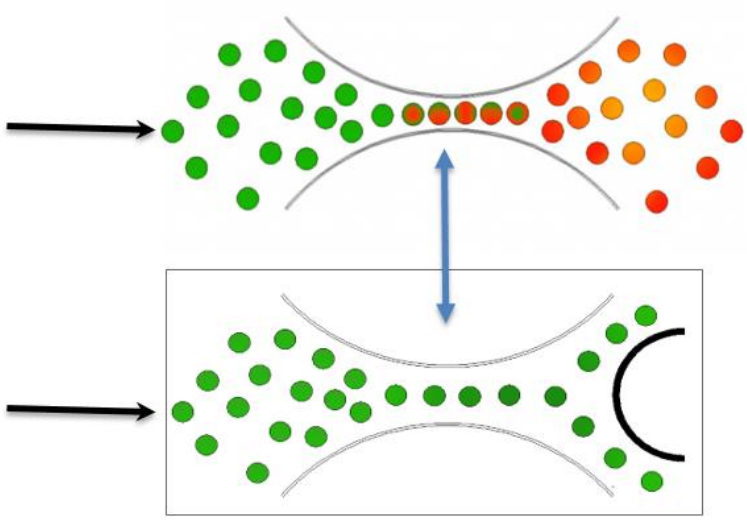

Figure 5: shows a mechanism for comparing the role of the motion paths in achieving physical distancing, proposed 3 (prepared by the researcher)

14. Conclusion

Motion paths have an important role in terms of communication, interdependence and transition between spaces, whether they are of the type of spaces (contiguous, repetitive, sequential or parallel and overlapping) and according to the distribution axes between them and the organizations, whether they are major or sub-spaces (general, semi-public, private) and that the paths have Movement is an important aspect that gives the design flexibility, continuity and dynamism of continuous movement, which ensures human activity in a healthy and safe manner, which raises the quality of the internal environment, raises functional efficiency and performance within spaces, and achieves important physical distancing.

15. Presentation and Interpretation of Study Results

15.1 Results

This study highlights how motion paths help achieve physical distancing to reduce COVID-19 spread, improve response speed, and develop safer design solutions. The researcher calls for increased future studies to address design challenges, establish new standards, and create safer, more comfortable environments that support public health and user well-being.

This study showed important results that can be summarized as follows: -

1. The interior design is a basis for positive interaction, whether with variables and challenges and the development of solutions to them, and it is by providing safer, healthier, and more productive interior environments and spaces.

2. The successful design is the design that simulates reality with all its variables in finding new ideas and design alternatives that fit the requirements of the new era.

3. Adoption of the flexible design in the interior design, which is the most interactive with the life variables and its ability to reshape and reconfigure the interior spaces according to the new functional requirements.

4. The process of employing motion paths of all kinds and forms and its important impact on the dynamic movement and direction process and its relationship in achieving physical distancing and creating a healthy, safe, and more efficient environment and producing interaction and communication within the internal spaces.

5. Emphasis on the statement of the importance of sustainable environmental design and smart design and their important role in facing all challenges and major changes and their essential role in achieving physical distancing.

16. **Suggestions and recommendations**

16.1 ***The researcher recommends the following: -***

1. Conduct future-oriented studies to address interior design challenges, reevaluate current designs, and educate designers on adapting to changes.

2. Establish standards and prepare experts to handle emergencies, raise awareness about physical distancing, and update on activity suspensions and mitigating measures.

3. Standardize concepts to enhance design quality and efficiency.

4. Develop design models explaining new motion path systems and their significance.

5. Create design alternatives to adapt to changing life variables and future needs.

6. Improve design programs to meet modern requirements and conduct long-term studies on changes and alternatives.

7. Refine design ideas to achieve high-quality, healthy environments.

8. Foster communication among stakeholders and develop educational curricula focusing on motion paths and interior space management.

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