

The Impact of Design Elements on the perception of spaciousness in Interior Design

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Abstract:

This study was driven by awareness about the global housing crisis, concerns about the as well as land and resources scarcity. Today the pressing concern worldwide has resulted in a tendency to build houses that are much smaller than before. Interior designers therefore want to employ various design elements such as shape, volume, color, and light in a room in order to create the impression that the room is larger than it is. While the tools used by interior designers do not actually change the physical characteristics of space, they create visual illusions that alter the way individuals perceive space and spaciousness. The purpose of this research is to look at the long list of design elements that can influence the way people perceive the size of any room. This research therefore seeks to stress the importance of all design tools and elements that can be used in order to convey a feeling of spaciousness. With the scarcity of urban land and housing in general worldwide; the trend is to decrease the size of the housing unit. On the other hand, environmental concerns encourage the decrease of housing unit's size in order to save resources, energy usage and reduce emissions. This research aims to shed light on the ability of interior designers to employ design tools to convey a feeling of spaciousness on Interior spaces.

This research aims to examine the role of various design elements in the perception of room spaciousness and size. It confirms that the perception of the spaciousness of any room is an objective variable, and not a physical one. The integration of design elements such as the shape, volume, color, and light can alter our perception of how spacious a room is.

The research outlined various results. It was noted that some colors and patterns impact the way humans perceive a certain space. The level of lighting, both natural and artificial, plays a major role in the creation of spaciousness awareness.

Floor plans can also be shaped to have an impact on the perception of spaciousness. Yet, room volume, despite being ignored by many designers, is another major factor that influences how humans notice spaciousness.

Thus the physical properties of space that characterize its level of openness, permeability and connectedness are crucial for its functional success. At the same time, it also influences its level of spaciousness - positively and negatively.

Keywords:

Design Elements
Perception
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Visual Connectedness

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Introduction

This research aims to examine the role of various design elements in the perception of room spaciousness. It confirms that the perception that the spaciousness of any room is an objective variable, and not a physical one. Thus, the way rooms are arranged can alter our perception of interior spaces. The integration of design elements such as the shape, volume, color, and light can alter our perception of how spacious a room is.

This research was driven by awareness about the global housing crisis, environmental concerns as well as land and resources scarcity. The pressing concern worldwide these days has resulted in a tendency to reduce the sizes of houses. Interior designers usually want to employ various design elements such as shape, volume, color, and light in

a room in order to increase the preceded the spaciousness thereof. While the tools used by interior designers do not actually change the physical characteristics of space, they create visual illusions that alter the way individuals perceive space and spaciousness. Interior designers must have a great sense of space, and this can only be gained through professional experience, research, education and continuous observation of various types of buildings.

The purpose of this research is to have a look at some of design elements that can influence the way people perceive spaciousness of rooms. It confirms that bright colors and natural tones can increase a sense of spaciousness when it is applied to walls and ceilings. It also confirms that rooms lit by either natural or artificially light can make a room look and feel more spacious.

When it comes to shape and volume, the spaciousness of a room can be increased through the use of circular and curvilinear walls. The higher the ceiling of a room, the more it creates a sense of space. In terms of design; the use of horizontal and vertical lines can broaden the room and create the sense that it is wider and higher. It is also noted that the layout of the plan and its level of openness and transparency increase the perceived spaciousness. This research therefore seeks to stress the importance of the use of all design tools and elements in order to convey a feeling of spaciousness.

The focus of interior design is to use interior elements, furniture, and other design tools to create a unique space that meets the physical and psychological needs of those who will live there. However, it is not just a case of painting walls and hanging a few curtains. One important component of interior design is to understand how those who inhabit a space perceive it based on a wide range of factors. Interior designers use tools and resources to help create a space that appears the way it is intended to be seen by the designer and the user, regardless of the constraints of the space or the way it appears prior to the work of the designer.

Philosophy and psychology of how space is perceived of space

Within the context of interior design, the philosophy and psychology of how space is perceived is a way in which designers can manipulate a certain space to achieve a particular feeling or perception from those who are in it. An article from the *Journal of Research Practice* states: "When designers create interior spatial designs for various types of uses and experiences, they consider both the aesthetic qualities of a space and how people experience interactions and sensations within the spaces" (Poldma, 2010). According to the requirements of the project, designers sometimes aim to make a space appear larger than its actual size. This is a very useful concept to make small apartments or awkwardly shaped rooms appear more comfortable and cozy than they actually are. In other cases, the designer may seek to apply certain design strategies to make the room feel more spacious.

According to Jaglarz, "Proper planning, interior elements, furniture and mirrors placement can correct every space, while color and lighting considerations can be used to emphasize the space or place" (Jaglarz, 2011, p. 1). While the tools used by interior designers do not actually change the space, they create visual illusions that alter the way individuals view the space according to the

way the designer wants it to be seen.

The role of perception of space in interior design is strongly linked to those who will use and live in that specific room. According to an article published in *Design Principles and Practices*, "As practitioners we solve the design problems for humans who use and inhabit the space. We consider their needs, whether functional, social, psychological or environmental by understanding how to use research to help identify and clarify the relationship between human behavior and the built environment" (Perolini, 2010, p. 172). According to this article it is clear that interior designers must use theory and research to base their design elements on. To be more specific, they must understand the psychology behind interior design and the perception of space, as it can help them to understand the way people view spaces and to create effective and appealing designs. Interior designers should be highly sensible to understand space and its characteristics. This sensibility is gained through years of professional experience, research, education and continuous observation of how other buildings, rooms and spaces are designed. The elements interior designers use to manipulate the perception of space are form, color, light, and the arrangement of interior elements such as furniture, lights and mirrors.

Color and light are frequently used to make a space appear bigger, and a great deal of research has been done to examine the use of color in interior design. For example, a study by Banu Manav, Rana Güvenkaya Kutlu, and Mehmet Şener Küçükdoğu "analyzes and compares color emotions of people with respect to the difference in illuminance and wall color at a full scale test room, without daylight" (173). The study revealed that, when one compares light yellow and light blue walls in a certain room, yellow walls are associated with positive emotions and are more stimulating (Manav, Kutlu, & Küçükdoğu, 2010, p. 173). In the same way color has a direct impact on people's emotions when they are in a room, as it can impact the way they perceive the room itself. For example, lighter colors, as opposed to darker ones, make a room appear bigger. Along similar lines, rooms with proper lighting can appear bigger, whether the lighting comes from lamps and overhead light fixtures or from large windows that allow natural light to flow into the room. The furnishings in a room can also be used to make it look bigger. Interior designers ensure that the furniture and other fixtures in a room are proportional to the room itself so that the room does not appear cluttered or overly crowded. In addition, interior designers may use design

elements such as mirrors to reflect light or emphasize interior details so that a room appears bigger.

Along with these psychological factors, culture also plays a part in how space is perceived. According to Annett Zinsmeister, "Culturally shaped perception models change our understanding of space, our relationship to space and our use of space." Another interior designer, Jonathan Crary, says that "human perception is based on a culturally significant range of expertise that is changing over time and has become controlled since the invention of optical devices in the nineteenth century" (Perren & Mlecek, 2015, p. 11). It is logical that the way an individual perceives a space is influenced by his or her culture since culture frequently shapes an individual's values and what elements of design appeal to them. Interior designers must therefore incorporate cultural values into their interior design aesthetics too. Thus, spaciousness varies within different cultures - what is considered small in one culture might be adequate in another culture and the opposite is true as well.

Perception of space is an important concept in interior design, as it helps interior designers maximize space through the way the room appears. Using the psychology of perception, interior designers are able to use optical illusions, such as the use of color, light, and the placement of furniture to make a space appear bigger than it actually is. Through research into the philosophy and psychology of perception of space, along with what the individual want to use the space for, interior designers can create a spacious, comfortable, and aesthetically pleasing room.

The impact of color in the perception of spaciousness:

Color is an important aspect used by interior designers as they are used to enhance spaces. Color is a sensation caused by a certain quality of light recognized by the eyes and interpreted by the brain, and it is not the property of surfaces, spaces or objects. Consequently, in definition or description of color, one cannot exclude light (Oberfeld, Hecht, & Gamer, 2010). Therefore, color is simply an element that is created when light strikes an object and is reflected back to the eye. It has three properties namely hue, intensity, and property. Hue is the name of the color, for instance 'blue'. Intensity is the vividness or strength of the color such as vibrant, bright, or grayed. The property of color is its value, which means how dark or light it is. The color of a room has an impact of how big a room looks.

The intensity and value of the color have an

impact on the perception of space. According to Oberfeld, Hecht, and Gamer (Oberfeld, Hecht, & Gamer, 2010, p. 1999), the use of color to change the perceived dimensions of spaces is abundant, and the effects of the brightness or lightness of the interior services of a room are regularly applied. Color can manipulate the way people perceive the size and shape of a certain room.

Color and Interior Design

Light or cool desaturated colors increase the experienced spaciousness of the room. This is because light colored surfaces diffuse the distribution of light, therefore enlarging the perception of space. The cooler or light colors tend to recede; making it look further away. Matusiak observed that the impression of the dimension of the room could be manipulated by using a light color. (Matusiak, 2004, p. 115). A practical use of light color to make the small room appear bigger is to change the color of the walls, floor, and the ceiling. When the ceiling is light-colored, it raised the perceived height of the room. Another effect of the light color on the perceived dimension of the room size is that it makes the room look more open, and therefore bigger. An additional effect of light colors is that they appear to move away from the observer (Sundstrom & Sundstrom, 1986, p. 347). Examples of light colors are blue, violet, and green.

Saturated, dark, and warm colors have a different impact as it makes any room look smaller. Dark colors absorb light, so it reduces the perception of how big the room is, making it appear smaller than it actually is. They are advancing colors that appear to move towards the observer. For instance, to make a large room look smaller, paint the walls and ceiling with a dark color (Matusiak, 2004). Oberfeld, Hecht, and Gamer (2010) observed that when ceilings are painted with dark colors, they appear lower than when they are painted with light or cool colors. The phenomenon can be explained by the fact that if a bright object is subtending, similar visual angles as a darker object will be perceived to be closer (Oberfeld, Hecht, & Gamer, 2010, p. 1119). Dark or warm colors are colors like orange, red, yellow and a combination of these three colors.

Different natural colors bring different perceptions regarding space. Lighter colors such as white and yellow tend to have a receding effect, which makes rooms look larger than they actually are. On the other hand, darker colors tend to make rooms look smaller than they are. It is, therefore, safe to say that different natural colors have a different effect on the perception of a room's space. Natural colors can, therefore, be

manipulated to create the desired effect. They can be used to create a receding or advancing effect. (Matusiak, 2004, p. 115).

In interior design, the patterns and motifs also have an impact on the perceived size of a room. The pattern is the motif on a surface, material or object. It is an illustrative perception that can define the surfaces, pass a design style, impact scale or add to the visual interest of space. The motif is the idea or theme painted on the object and it is represented through constant repetition. The size of the motive and the color differences may make a pattern prominent or bold. For instance, walls painted with horizontal stripes make the room appear lower and wider, while vertical stripes on the wall make the room seem narrower and higher (Neufert & Kister, 2009). Patterns do not only enrich the interior surfaces and intrigue the eyes, it also provide a more powerful effect on the interior of the spatial room than any flat color. A room's floor or wall pattern has an impact on the dynamics of both the surfaces on which it is on and the spaces within (Miller, 1997, p. 23).

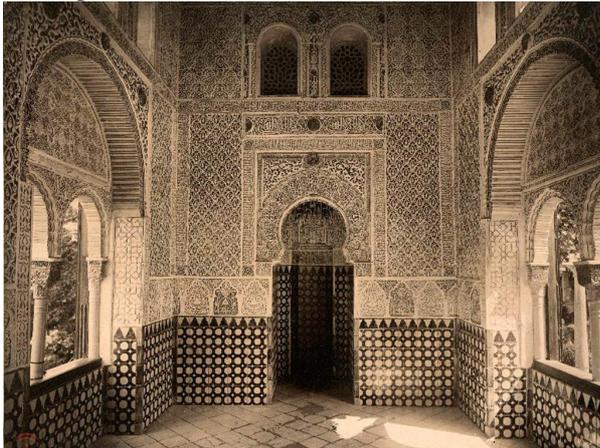


Figure 1 Motifs on the mosque's walls at Alhambra complex (source: <http://www.alhambra-patronato.es/>)

To conclude it all, colors have a significant impact on the perceived size of a room. The color is the quality of light that eyes recognize, and the brain interprets. How and what color used in the interior space of a room alter the perceived size, such that dark colors make the room appear smaller while light colors make the room appear bigger. The patterns on the wall also have a similar pattern as the dark and light colors, such that horizontal patterns on the wall make the room appear lower and wider, and the vertical stripes make the room look as if it is narrower and higher.

The impact of light on the perception of interior spaciousness

The use of natural and artificial light is one of the most important design elements that interior

designers use. They spend a lot of effort to determine the size and location of windows and artificial light sources. The amount of sunlight that penetrates a room influences its perceived size. Windows that are set low enough to capture the full extent of the sun and natural lighting visually increase the space in any room. (Pile, 2009, p. 36)



Figure 1 Large window (Source: <http://www.mpkelley.com/>)

Designers also study the best type of lighting fixture for a given room based on its function. They use many design guidelines to specify the type, amount and location of various lighting fixtures. Just like the use of color in interior spaces, the amount of light in a given room can influence the perception of spaciousness. (Ozdemir, 2010, p. 2277) cited several researches which confirm that the level of light is related to the perceived spaciousness. (Kirschbaum and Tonello, 1997; Inu and Miyata, 1973; Martylink, 1973; Oldham and Fried, 1987; Oldham and Rotchford, 1991).

The ceiling of a room will appear higher when it is painted in a color lighter than that of the walls. Light shades of paint in different rooms, specifically on different surfaces, play an important role in the perceived height of rooms. The height of rooms is determined by occupants based on the shade of the floor, walls, and ceilings. In fact, one study indicated that the total brightness of the room can influence the perceived height of a space, but that the lightness of the ceiling and walls can create a simple spatial effect that makes the room seem much bigger (Oberfeld, Hecht, & Gamer, 2010, p. 1).

The Impact of room shape on the perception of room size

In interior design, the shape of a room plays a big role. Various shapes utilize fundamental properties of geometry, and this is a key component to all interior designs. Geometric patterns add depth, bounce, and even shape to a room. The patterns

engrained in things like room size or volume serve specific purposes (Inoue & Takagi, 2009, pp. 25-33). The shape of a room, the location of doors and windows and various other architectural elements all play a role in the perception of room size (Pile, 20). Studies have found that interior environment can be altered through the perception of space inside interior design. Residential areas can integrate features of an outdoor environment and influence the spatial perceptions of those inside the room in doing so (Mandel, Baron, & Fisher, 1980, p. 308).

Rectangular rooms have two identical lines parallel with one another. As a result of this linear structure, it gives the viewer a sense of spatial stability. Rectangular rooms are static, rigid, and can have the dynamics increased with 3D objects. Rectangular-shaped rooms are the most prevalent in modern room architecture, particularly for things like bedrooms, living rooms, and bathrooms (Pile, 2009, p. 16).

The length of the walls of square rooms are equal on all sides and therefore complimentary to other shapes, like corner nooks or vaulted ceilings. In square rooms, having one door away from a wall allows that wall to be used, and it can serve as a place for things like large windows and mirrors to reflect natural lighting. Doors in a wall limit the use of that specific wall too. Windows set low enough to capture the full extent of the sun and natural lighting visually increase the space in any room, by making it seem as though the larger outdoor areas are part of the space inside. When it is combined with windows and natural lighting, interior elements can also increase the perception of space in a room. To make a room seem taller, interior designers can make use of rails or pictures frames. (Pile, 2009, p. 36)

Circular spaces are viewed as perfect shapes, without a beginning or end. When combined in a room either as a nook or as the shape of the space, it increases balance and unification, offering strong energy and increasing the space to the eye. By alleviating hard lines and right angles, circular room spaces create the illusion that the room has no beginning or end, and therefore is much larger and expansive.

Elements like nooks can alter the perceived size of the room. Corner nooks can have a square or circular design, occupying a single corner in a longer room. Centralized nooks or bays are often rectangular, elongated and spanning the length of one wall. The few additional square centimeters provide a more comprehensive view, additional natural light, and even built-out sections that can be separated by tables or pillars, making it appear

as though there is twice the available space in a single room.



Figure 2. Bay window or centralized nook (source: <http://interiorsbystudiom.com/windows-interior-design-architecture-detail/>)

Irregular room shapes include things like ovals, diamonds, and triangles. Oval spaces maintain strong energy and hold warmth. By retaining balance with the added features in the room, oval spaces also offer the lack of beginning or end, lack of hard lines and right angles, or lack of corners. This is what creates the illusion that the space is much larger than it really is (Abercrombie, 1990, p. 12)

Room volume in interior design

The volume of a room often refers to the actual amount of physical space offered in the room. Volume calculations can be altered by lower and upper boundaries in a space, and not just the room bounding elements. The ceiling or roof might extend beyond the upper limit of a room, and is therefore part of the revised volume of the space. When it is not limited to the physical space, interior design can work in tandem with the form and shape of the room to increase the perception its size.

Form and shape are the areas that define objects in design, as they are two or three dimensional, and are best described as organic or geometric. Organic forms are generally associated with naturally occurring elements with asymmetrical lines, which can be recreated in a room. Geometric forms remain more common though, such as squares, rectangles, circles, and spheres. Designed forms can consist of geometric construction with organic designs (Welch & Witkin, 1994, p. 5).

Designers often resort to the creation of double height spaces in order to enhance connection,

utilize the available volume and create a sense of spaciousness. As Bernard Hoesil describes: “The connection between the space of two separate levels through a common expanse of air has the



Figure 3 Spacious Double Height Apartment Designed by Squire and Partners Architects. (source: <http://archinspire.pro/sleek-apartment-interior-design-double-height-open-style/>)

The perception of shape and form is impacted by factors such as the position or viewpoint from which someone is looking at a room. Sometimes objects emphasize or obscure features in a room and make a specific impact on the viewer. For example, large mirrors that form a right angle against an open bay window reflect light throughout a space better than a window alone might do. The result of this design element is that the room appears larger to the naked eye.

Space can distract, focus, or alter the impression of any shape and form. Cluttered backgrounds in rooms diminish the importance of objects within the room, while plain walls draw attention to the few focal pieces in it. As stated earlier, lighting, too, plays a strong role in this. When one considers the example above, the lighting from natural and manmade sources impacts one's perception of shape and form. A dining room light fixture situated opposite the bay window will also reflect in the mirror, adding depth and space to the room. The plan, shape, and volume of a room all play a role in the perception of how big the room is, primarily insofar as lightness is concerned. It is the perception of lightness of things seen in the outside world which helps the brain to recognize visual space and light. The brain recognizes the lightness elements in nature and uses them to interpret space in interior design. This means that the amount of color contrast, whiteness, and lightness in a room can alter the perception of physical volume and space. (Ikeda, Shinoda, & Mizokami, 1998, p. 380) One study found that there to be no scientific link between furnishings in a room and perceived spatial dimensions, lending more credence to the previous research

effect not only of optically increasing the size of small rooms but also of generating ambiguous spatial relations.” (Rowe & Slutzky, 1993, p. 72)



surrounding the link between lightness and perception of space (von Castell, Oberfeld, & Hecht, 2014, p. 3). Therefore, the furniture in a room is not nearly as important as the form and shape of the room and lightness used in the space when it comes to the influence of how one perceives space.

Ceilings are an important factor too. Dome shapes resemble the upper part of a sphere, historically used throughout Mesopotamia, Persia, Rome, China, through medieval Islamic buildings and modern Western European structures. In Islam in particular the meaning of the dome is directly tied to the concept of spaciousness as it represents the vault of heaven. Domes today utilize advanced mathematics and technology to create legislative buildings, religious buildings, and more (McLeod, 2010, p. 27).



Figure 4. Interior and Dome of the Blue Mosque, Istanbul (source: https://en.wikipedia.org/wiki/Sultan_Ahmed_Mosque#/media/File:Inside_Blue_Mosque_3.jpg) Cone or cylindrical shapes rise to a point, creating a cone-like final point at the top of the roof.

Historically such designs were popularly attributed to castle towers.

One study has shown that when lightness is increased in a certain space, either by the walls, floors, or furniture, it can make the space seem bigger. This study indicated that people perceive ceilings as higher and rooms larger in general when lighter colors are used and when those colors are contrasting to other colors in the room (Mizokam, Mitsuo, & Shinoda, 1998, p. 380). Thus, it is evident that design element cannot be used independently. Designers should employ the various design elements comprehensively to support each other and create the design feel they desire.

The type of ceiling is not the only influencing factor – the height of the ceiling and design plays a role as well. Drop ceilings, also known as suspended ceilings, are found in many homes today, and they are installed in almost all basements and other rooms. They have two parts - the first is the suspended metal grid to which the second, the acoustic panels, are attached to. These panels are inserted into the metal grid. Decorative options are available such as metal panels or coffered panels. Such a design is relatively flat, without any angles or geometric features beyond the natural shape of the room. Ceiling tiles can be smooth or textured, capitalizing upon antique tin designs that complement traditional and contemporary spaces. Such tiles attach directly to an existing ceiling, which means they work well with any geometric space and can increase the volume in a room (Mitton & Nystuen, 2007, p. 22).



Figure 5. Lotte Department Store in Seoul, South Korea by Kareem Rasheed

In addition to gypsum false ceiling, designers may use natural materials too for interior ceilings. Tongue and groove ceilings use authentic wood panels which often become the focal point of the space. Due to the fact that they are elegant, such designs are ideal for textural contrast in any space and they visually enhance the appeal of the room.

Different patterns can be painted and used to complement existing spaces and add more depth and space to the feel of the room. Light-colored wood tones reflect light naturally, which means they create an illusion of a brighter and bigger space. Darker wood tones create the illusion of lower ceilings and it makes the room feel warmer and cozier. Coffered ceilings are sunken panels attached to the suspended grid. These sunken panels are sunken toward the ceiling, which adds arch and length to the space. They can be deep or shallow, which creates a lighter feel in the existing space (Mitton & Nystuen, 2007, p. 23)

With each of the aforementioned ceiling styles, the vaulted ceiling design is an option for either a tiered ceiling or a flat ceiling. Vaulted designs add height to the space, and combined with lighter wood colors they increase the perception of the size of the room. Likewise, tiered ceilings can allow for one part of the room to appear bigger than the other (ibid).

Lines and the perception of space

The line is one of the fundamental elements of interior design, because lines are complex in the sense that they change the perceived size of space. Lines have psychological effects on a room. Interior designers use various types of lines to create a particular ambiance or mood in a room. The combination of lines may also be used to create the desired effect. However, one line is planned to dominate in order to create a given effect. Various types of lines can be used, such as straight lines, angular lines, and curved lines. This section examines the impact of straight lines, which are vertical and horizontal lines on the perception of space size.

(Hepler, Wallach, & Hepler, 2013, p. 22) states that interior designers use lines to enclose space and provide the contour or outline of forms. The line as an element of design can produce a sense of movement and it also gives the viewer a sense of height or length. Lines basically shape or form subjects on a two-dimensional surface. The aspects of the line include thickness, path, direction, evenness, length, consistency, continuity, contour of the edge, and sharpness of the edge. Interior designers use lines to make the room appear either higher or lower than it is in reality. Both horizontal and vertical lines create a feeling of alertness, strength, apart from widening the room and making it appear lower, and making the walls appear higher respectively (Ballas, 2013, p. 3).

Since vertical lines lead the eyes, spirit and mind upward, they create an impression of height. These lines are associated with strength and stability,

elevation, thick pillars of strength, and balance. Vertical lines tend to extend away beyond the observer's visual plane; therefore making the perceived height of the room appear higher than it really is (Neufer & Neufert, 2012, p. 42). Vertical lines are perfect for entryways, formal dining rooms, and formal living areas. However, using too much vertical lines creates a feeling of confinement or uneasiness. According to (Jaglarz, 2011, p. 358) lines can be used to correct the interior space since they have a considerable effect in proportional, size and mood of space.

Since vertical lines narrow the room on the level, they create an illusion of the room being higher than it really is. A room can be made to appear visually higher through the use of vertical stripes of various colors, or vertical ornaments or patterns against the wall. Additionally, one can use pictures, vertical divisions or paintings in such a way that they appear in a vertical line. This will create the same illusion by making it appear higher. More room height effects can be achieved by the use of the patterns of finishing materials with gloss varnishing or patterns on the background (Jaglarz, 2011, p. 364).

Unlike vertical lines that narrow the room making it appear higher, horizontal lines widen the room; making it appear lower. Just like vertical lines, the horizontal lines or stripes evoke the feeling of



Figure 6. The use of vertical Lines in Interior spaces (source: <http://borqe.ir/wp-content/uploads/2016/06/1-10-3.jpg>)

In conclusion, the line is one element of interior design that, when used, can change the perceived size of the room. Vertical and horizontal lines change the visual sizes of the room. The vertical lines make the eyes move upward - creating a perception that the room is higher than it is. Horizontal lines broaden the room making it appear wider than it is. Additionally, both vertical and horizontal lines create a feeling of grounding, stability, direction, elevation, and emphasis.

Interior openness and the perception of space Within the interior spaces of buildings, connectivity refers to the way interior rooms are

grounding, stability, direction and emphasis. Such lines tend to lower the ceiling and create a length of space. The horizontal lines can be used to direct the viewer to the specific focal point. The lines also suggest a harmonious, solid relationship with the earth, which offers the viewer a sense of tranquility. They can expand the room visually making it appear wider and longer (Jaglarz, 2011, p. 364). An interior space painted with horizontal stripes tend to move the eye horizontally, which emphasize the width of the room (Hepler, Wallach, & Hepler, 2013, p. 22). A single horizontal line running from one side of the wall to the side increases the width of the wall as it makes the eyes move to the 'nothingness' at the end of the line. However, a single horizontal line on all walls of a room makes the room appear constricted as the eyes are confined to these lines. A line high on the wall, with the same color as the ceiling enlarges the ceiling - making the room appear visually larger. The walls may appear shorter making the room appear smaller. This happens if the line is in the middle of the wall and has high contrast color. A series of horizontal lines of the same color and width on entire walls makes the room appear visually higher. Similar color lines that has a high contrast color provide the same expanding effect (Erlam, 2016).



Figure 7. The use of Horizontal Lines in Interior spaces (source: <http://aceinteriordesign.weebly.com/>)

accessible and visually open. In general a space that is well-connected provides easy access to various parts of the building. Openness and connectivity within an interior environment create a feel of spaciousness. Designers create openness through the removal of boundaries, transparency and reflectivity.

Designers employ different element to create borders within space according to functional requirements. These borders act as filters and may contain openings to allow space occupants to see through or varying degrees of solidity.

Permeability is defined in many ways such as

being able to move from place to another as well as being able to pass through something else. Permeability can be created through design by the manipulation of void, form and materials. These design techniques can control the level of openness and connectivity and as a result impact the feel of spaciousness.

Colin Rowe outlines the definition of transparency as “the quality, or state, of being transparent in both a material condition – that of being pervious to light and air – and the result of an intellectual imperative, of our inherent demand for that which should be easily detected, perfectly evident, and free of dissimulation.” (Rowe & Slutzky, 1993, p. 76)

In interior design, transparency allows space users to perceive different spaces simultaneously. Designers achieve transparency within buildings through understanding two important aspects of design, and that is permeability and reflection.

Reflectivity is defined in the dictionary as the “fraction of radiant energy that is reflected from a surface”. Interior spaces with a high degree of reflectivity gives a sense of transparency, despite being opaque. Reflectivity gives a sense of unreal transparency to solid objects and make them disappear within the surrounding. By using high reflectivity surfaces within interior spaces such as ceilings, walls, floors or large mirrors one can create a sense of spaciousness. “A space may be perceived as larger because of transparent surfaces such as screens and windows ... complex spaces are perceived darker and confined”. (Ozdemir, 2010, p. 2277)

Visual Connectedness

The main role of building designers is to create functional spaces that meet the needs of their occupants. Among the main characteristics of rooms is the level of privacy they require. Whether in public or private buildings, people clearly ask to distinguish between public/social and private areas. For example, in residential buildings the classical design solution usually leads designers to locate semi-public areas in the ground floor such as reception, living rooms or kitchens, while allocating private rooms on upper floors such as bedrooms.

Designers special use design elements to create the desired level of openness or closure required in certain spaces. This is achieved through the placement of physical boundaries such as furniture units, walls, fences, screens, doors, windows and many more.

It is important to note that different cultures demand a varying degree of privacy and/or division of spaces. This is particularly evident in

the design of Arab House and Japanese House as an example.

Humans perceive their environment through their five senses being kinesthetic, touch, hearing and smell. The creation of physical boundaries regulates and control how humans perceive their environment. The feel of spaciousness is thus increased the more a human can read the maximum area of his immediate environment.

Discussion

The aim of this article is to shed light on the main design element that could be employed to increase the feel of spaciousness any room or building. It seeks to confirm that design is able to change people’s perception through the strategic manipulation of various spatial configurations and treatments.

The application of color, whether through paint or furniture, wall paper or cladding of natural material has been an integral part of interior design. Yet, interior designers should understand that some colors and patterns impact the way humans perceive spaciousness.

Today, with the availability of artificial light, people tend to care less about its impact as a design tool. Designers must pay special attention to the way natural light is controlled and how artificial light is chosen and located. Because lighting level play a major role in the creation of spaciousness awareness.

Interior designers influence the shape, form and volume of interior spaces. These design decisions must be taken with careful comprehension of their impact of the users of space. This article has shown that the shaping of floor plans can impact the perception of spaciousness. Yet, room volume, despite being ignored by many designers, is another major factor that influences how humans notice spaciousness.

When creating design solutions, designers aim to fulfill functional, aesthetical and cultural requirements. Among the leading design limitations is the required level of privacy in both residential and commercial projects. Thus the physical properties of space that characterize its level of openness, permeability and connectedness are crucial for its functional success and at the same time influence its level of spaciousness positively and negatively.

References:

1. Manav, B., Kutlu, R. G., & Küçükdoğu, M. Ş. (2010). The Effects of Colour and Light on Space Perception. *Colour and Light in Architecture_First International Conference Proceedings*, (pp. 173-178). Venice, Italy.

2. Neuffer, E., & Neufert, P. (2012). *Neufert Architects' Data* (4th Edition ed.). Chichester, West Sussex, UK: Wiley-Blackwell.
3. Saygin, Z. M., Osher, D. E., Norton, E. S., Youssoufian, D. A., Beach, S. D., Feather, J., et al. (2016, September). Connectivity precedes function in the development of. *Nature Neuroscience*, 19(9), 1250-1255.
4. Abercrombie, S. (1990). *A Philosophy of Interior Design*. New York, NY, USA: Harper & Row.
5. Ballas, D. K. (2013). *Interior Design Reference Manual: Everything You Need to Know to Pass the NCIDQ Exam* (6th Edition ed.). Belmont, CA, USA: Professional Publications, Inc.
6. Bokharaei, S., & Nasar, J. L. (2016, May 26). Perceived Spaciousness and Preference in Sequential Experience. *Human Factors*, 58(7), 1069-1081.
7. Deleuze, G., & Guattari, F. (1987). *Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press.
8. Erlam, L. (2016). *Do Horizontal Stripes Make a Room Look Larger?* Retrieved October 3, 2016, from SFGATE: <http://homeguides.sfgate.com/horizontal-stripes-make-room-look-larger-85796.html>
9. Hepler, D. J., Wallach, P. R., & Hepler, H. (2013). *Drafting and Design for Architecture & Construction* (9th Edition ed.). Clifton Park, NY, USA: Cengage Learning.
10. Ikeda, M., Shinoda, H., & Mizokami, Y. (1998, November). Phenomena of Apparent Lightness Interpreted by the Recognized Visual Space of Illumination. *Optical Review*, 5(6), 380-386.
11. Imamoglu, V. (1976). The relation between room organization and spaciousness. *METU JOURNAL OF THE FACULTY OF ARCHITECTURE*, 2(2), 205-124.
12. Inoue, M., & Takagi, H. (2009, January). Architectural Room Planning Support System using Methods of Generating Spatial Layout Plans and Evolutionary Multi-objective Optimization. *Transactions of the Japanese Society for Artificial Intelligence*, 24(1), 25-33.
13. Jaglarz, A. (2011). Perception and Illusion in Interior Design. *Universal Access in Human Computer Interaction Conference*. Orlando, FL.
14. Leddy, T. (2016, Feb 8th). *Dewey's Aesthetics*. Retrieved September 30, 2016, from Stanford Encyclopedia of Philosophy: [http://plato.stanford.edu/entries/dewey-](http://plato.stanford.edu/entries/dewey-aesthetics/)
15. Mandel, D. R., Baron, R. M., & Fisher, J. D. (1980). Room Utilization and Dimensions of Density: "Effects of Height and View". *Environment and Behavior*, 12(3), 308-319.
16. Matusiak, B. (2004). The Impact of Lighting/Daylighting and Reflectances on the Size Impression of the Room. Full-scale Studies. *Architectural Science Review*, 47(2), 115-119.
17. McLeod, V. (2010). *Encyclopedia Of Detail In Contemporary Residential Architecture*. London: Laurence King Publishing.
18. Miller, M. C. (1997). *Color for Interior Architecture*. Wiley Publishing.
19. Mitton, M., & Nystuen, C. (2007). *Residential Interior Design: A Guide to Planning Spaces*. Hoboken, NJ, USA: Wiley.
20. Mizokami, Y., Mitsuo, I., & Shinoda, H. (1998). Lightness Change as Perceived in Relation to the Size of Recognized Visual Space of Illumination. *Optical Review*, 5(5), 315-319.
21. Nguyen, V., Breakspear, M., Hu, X., & Guo, C. (2015, September). The integration of the internal and external milieu in the insula during dynamic emotional experiences. *Neuroimage*, 124(A), 455-463.
22. Oberfeld, D., Hecht, H., & Gamer, M. (2010). Surface lightness influences perceived room height. *The Quarterly Journal of Experimental Psychology*, 63(10), 1999 - 2011.
23. Oberfeld, D., Hecht, H., & Gamer, M. (2010). Surface lightness influences perceived room height. *The Quarterly Journal of Experimental Psychology*, 63(10), 1999-2011.
24. Ozdemir, A. (2010, August 18). The effect of window views' openness and naturalness on the perception of rooms' spaciousness and brightness: A visual preference study. *Scientific Research and Essays*, 5(6), 2275-2287.
25. Perolini, P. S. (2010). Interior Spaces and the Layers of Meaning. *Color and Light in Architecture First International Conference*, (pp. 173-178). Venice, Italy.
26. Perren, C., & Mlecek, M. (2015). *PERCEPTION in Architecture: Here and Now*. Newcastle upon Tyne, NE6 2PA, UK : Cambridge Scholars Publishing .
27. Pile, J. (2009). *A History of Interior Design* (3rd Edition ed.). Wiley.
28. Poldma, T. (2010). Transforming Interior Spaces: Enriching Subjective Experiences through Design Research. *Journal of*

- Research Practice*, 6(2).
29. Rowe, C., & Slutzky, R. (1993). *Transparency*. Basel: Birkhäuser Architecture.
 30. Sundstrom, E., & Sundstrom, M. G. (1986). *Work Places: The Psychology of the Physical Environment in Offices and Factories*. Cambridge : Cambridge University Press.
 31. Topornycky, J., & Golparian, S. (2016). Balancing Openness and Interpretation in Active Listening. *Collected Essays on Learning and Teaching, IX*, 175-184.
 32. Tuan, Y.-F. (1977). *Space and Place: The perspective of Experience*. Minneapolis, USA: University of Minnesota Press.
 33. von Castell, C., Oberfeld, D., & Hecht, H. (2014). The Effect of Furnishing on Perceived Spatial Dimensions and Spaciousness of Interior Space. *PLOS One*, 9(11).
 34. Welch, W., & Witkin, A. (1994). Free-Form Shape Design Using. *Proceedings of the 21st annual conference on Computer graphics and interactive techniques* (pp. 1-10). ACM.