



Work / Space: Seeking Nature-Based Design Solutions for Well-being

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Abstract

The majority of people are now living in urban areas and this proportion will increase every year. We lived and are surrounded by the modern city, the man-made built environment, and especially the workspace where we spent most of our time and a lot of time, we get stress from work. Abruptly, the COVID-19 pandemic has brought the unprecedented way of work, social-distancing, and work from home. We are forced to work remotely, and though we can connect through devices, we still get stress. An important reason is that we are disconnected from nature, our healer. Why? Because we are biologically innately connected to nature, which is our natural habitat. This problem has brought attention to the author to seek a nature-based design that can help improve people's well-being in the workspace environment. The author has studied a sustainable framework as a based criterion and sorted the most related principle to use as a methodology. The extracted results were the prototype design concept that aims to offer better mental and physical health to the new generation in the work context and leave some room in the design to urge their creativity and flexibility, which are crucial in the future of work.

Keywords: *Biophilic, Covid-19, design, flexibility, nature, stress, solution, well-being, workplace*

1. Introduction

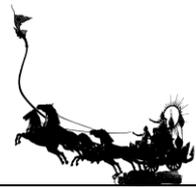
Data from the United Nations has shown that in 2018, 55% of people live in urban areas and by 2050, the number will increase by 13%. These numbers showed the growth that carries people from the countryside to urbanized areas, which means that another 2.5 billion will be added to the overall world's population in urbanization (United Nations, 2018).

In the modern urbanization development, architecture, and indoor environment, people largely live indoors, especially in the workspace where we spent most of our time. Meanwhile, the "natural habitat" has evolved in the natural world, reflecting an increasing disconnect between people and nature in the built environment. The results are insufficient contact with natural view, light, materials, shapes, and forms, which are critical to our well-being (Kellert & Calabrese, 2017). With the COVID-19 pandemic, the increased stress feels more present than ever (Casamassima, 2020).

Concerning the impact of stress on the body, for the brain, it can influence memory in terms of declarative disorders, reduce spatially, and weakening verbal, which is the most important function of the central brain system as well as cognition and learning. It means that it can affect reception, perception of recognition, and interpretation including concentration and decision making. Stress can also cause reducing cognition, making behavioral and mood disorders, as well as decreasing reaction time (Yaribeygi et al., 2017). These are the causes of critical effects on human well-being in the work environment.

Firstly, a definition of Workspace from dictionary.com is stated as "the space used or required for one's work, as in an office or home." Well-being is defined by the Oxford English Dictionary as "the state of being comfortable, healthy, or happy." While WHO defined Health as "A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Kim, 2012).

The COVID-19 outbreak had brought the link between the built environment and human health into focus (World Green Building Council, 2020). In the post-pandemic era, emotional well-being will become more important than ever. Nevertheless, of what our workspaces will look like in the future, it makes sense that we need to give more thought to how they make us feel. Within the fields of nature-based design and environmental psychology, there is a growing number of research indicating how the design of work



environments can impact our overall quality of life, considering how we spend most of our lives indoors (Casamassima, 2020). How can we improve our Well-being? This article will discuss and seek some applications.

Health and well-being are essential for all humans. There are few issues relating that are not impacted, direct or indirect, by the quality of the built environment that will be a major impact on the quality of life. It supports our communities, including all sorts of buildings and the infrastructure in our daily lives in homes, schools, workplaces, and hospitality that makes urban better places. Nevertheless, the built environment can also be quite challenging to our health and well-being (World Green Building Council, 2020).

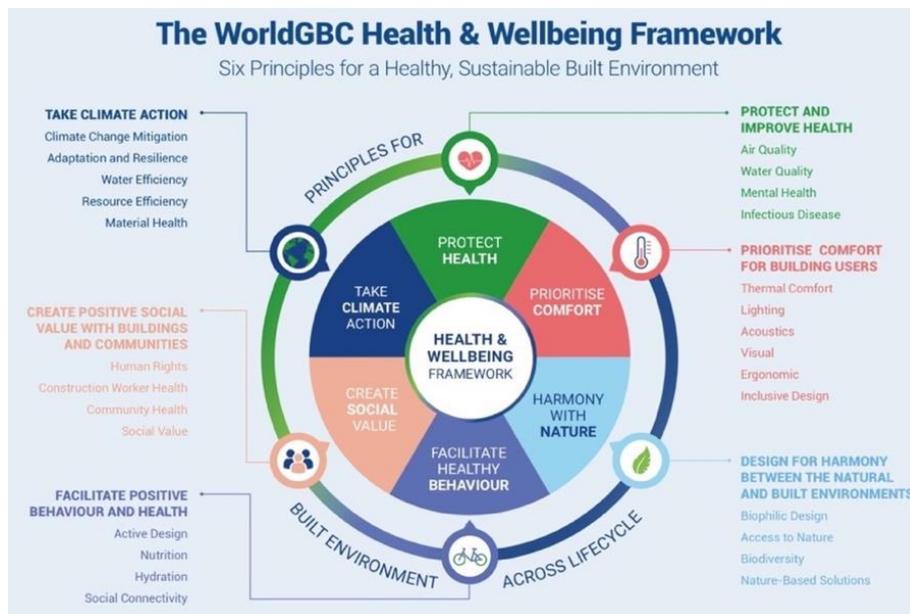


Figure 1 Six principles for a healthy, sustainable built environment Framework

Source: World Green Building Council, 2020

WorldGBC Health & Well-being Framework for a sustainable built environment composed of six principles:

1. Health to protect and improve
 - 1.1. Air quality at a suitable level to reduce health risk
 - 1.2. Water quality at a suitable target to reduce health risk
 - 1.3. Improve mental and social health through the building design
 - 1.4. Reduce contagious disease within the built environment
2. Comfort to prioritize for building user
 - 2.1. Thermal comfort to improve well-being with occupant needs
 - 2.2. Commendable lighting to improve well-being, and energy proficient solutions
 - 2.3. Acoustic comfort within suitable parameters
 - 2.4. Broader comfort measure to avoid occupant well-being risk
 - 2.5. Assure inclusive design of the built environment
3. Nature in harmony
 - 3.1. Access nature within the building with the biophilic benefit
 - 3.2. Access nature outdoors to encourage biodiversity
4. Behavior to facilitate the positive health
 - 4.1. Promote indoors and outdoors activities to encourage physical health



- 4.2. Stimulate useful vitality and social connectivity
5. Social value to create the positive communities
 - 5.1. Protect human rights through the building lifecycle
 - 5.2. Deliver and improve communities value and quality of life
6. Climate the action
 - 6.1. Perform whole-life zero carbon emissions
 - 6.2. Inspire adaptability strategies for climate change
 - 6.3. Utilize resource efficiently to avoid shortage crises
 - 6.4. Assure usage of circular materials across the building lifecycle

Through six headline principles, the World GBC Health & Well-being Framework (Figure1) provides detailed information on the key aspects of human health, well-being, and quality of life-related to the built environment area throughout the lifecycle. Each principle has reported the challenge and opportunity of each element of the built environment to human Well-being (World Green Building Council, 2020).

This study will focus on the third principle; Harmony with nature: Design for harmony between the natural and built environments, comprised of four sub-principles (Figure 2),

1. Nature-based solution
2. Biophilic Design
3. Access to nature
4. Biodiversity

with the aim to let people access nature in the building with the biophilic benefits, as well as an outdoors, to encourage biodiversity in the environments and the remainder 5 principles are the secondary (World Green Building Council, 2020).



Figure 2 Detail on the third principle: Nature design in harmony for the built environment

Source: World Green Building Council, 2020

As stated, the main purpose of this study focuses on why well-being is very crucial for human beings. From the World GBC Health and Well-being framework, a Nature-based solution and Biophilic Design in the Harmony with Nature Principle is the right fit. This research will investigate how it is an important element in the work environment and will dive deep into the term Biophilia, where it is derived from, and what makes us affiliated to nature.

Biophilia

This term was first created by social psychologist Erich Fromm in 1964 and popularized by biologist Edward O Wilson in 1984. The concept of biophilia explains that humans are naturally drawn and affiliated



to nature (Lerner & Stopka, 2016). Many research works showed that humans are inclined to the natural than the built environment. The notion of biophilia grows from the understanding of human evolution, explaining more than 99% that we are innated in the adaptive reaction to nature, not the artificial environment. The human mind, body, and senses develop in a surrounding of nature-centric not human-engineered (Kellert & Calabrese, 2017). It helps illustrate why morning sunlight and gentle wind breeze calming us (Brown, Ryan, & Clancy, 2014).

Biophilic Design

Derived from biophilia, the theory develops with the positive effects of the human body and brain perceived in contact with nature. Research suggests that biophilic design should be applied to human life and the built environment to improve well-being and productivity. The application of connecting humans to nature within the manmade environment (Lerner & Stopka, 2016).

The human response needs to connect with nature to re-establish contact in the built environment. It can reduce and heal stress, improve well-being, and enhance creativity and thought precision. Fundamentally, Biophilic design is a science and practice of creating buildings vitalized by nature to continue the connection in the environment in which we live and work every day (Browning, & Cooper, 2015).

2. Objectives

- 1) To study the background principle of well-being for the built environment
- 2) To seek the proper nature-based design to help improve people's well-being at the workspace

3. Material and methods

- 3.1 Study and analyze the principle of well-being for the built environment from the author's viewpoint
- 3.2 Design a flexible privacy screen using nature-based core materials
- 3.3 Create a prototype using a paper tube, elastic rope, and a nature-based pattern as a final design

4. Results and Discussion

4.1 Framework design

The practice can be defined into three categories – **Nature in the Space**, **Natural Analogues**, and **Nature of the Space** – presenting a principle for the incorporation of a multi diversity of design strategies into the built environment.

Figure 3 shows an example of Nature in space that addresses direct physical contact of nature in space, which comprises plant life, animals, water, sounds, scents, and other elements such as plants pot, flowerbeds, gardens, fountains, aquariums, and green walls. The powerful experiences are achieved through the meaningful direct connections with these natural elements, especially through the diversity and multi-sensory interconnection (Brown et al., 2014).

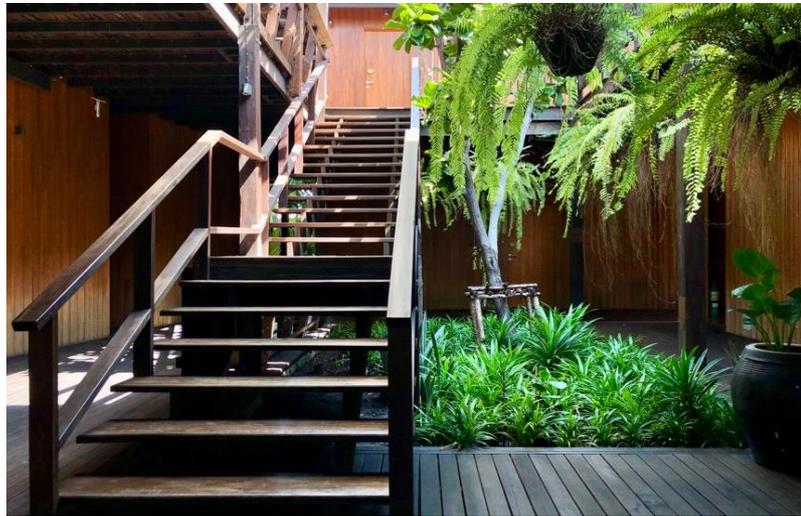


Figure 3 The direct contact presence of nature in the space

Source: Chann Bangkok Noi, Bangkok, Thailand

In the next example, the author expressed the Natural Analogs focusing on the essential, non-living, and indirect feeling of nature. Materials, shapes, forms, colors, objects, sequences, and patterns found in nature are presented as artwork, ornamentals, furniture, textiles, and decorations in the built environment. Impersonation of natural patterns, furniture in organic shapes, and natural materials have been produced in extensively reformed such as wood planks, ceramic, wall coverings, and upholstery. Each stimulates an indirect connection with nature. They are real and only analogous to the piece in their natural state (Figure 4). Good experiences are achieved through information richness in an organized and sensible way (Brown et al., 2014).

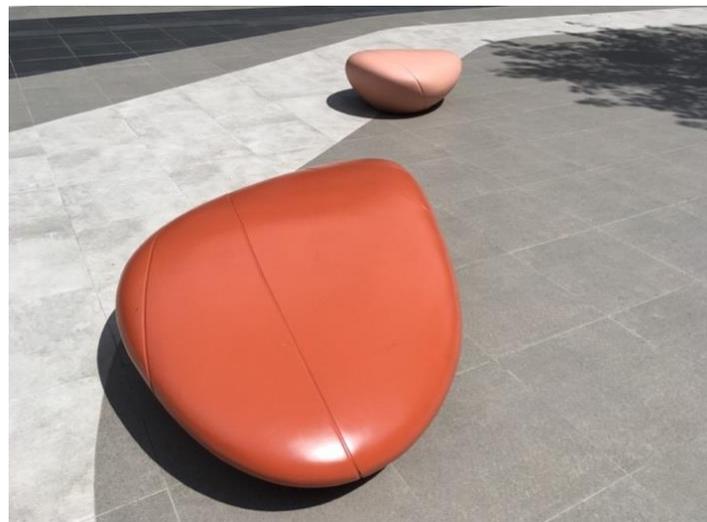


Figure 4 The impersonation of natural analogs, shapes, and forms

Source: Siam Premium Outlets, Thailand

Nature of the Space addresses the relative configurations of nature, which presents the inherent and yearning to see beyond our current surroundings, fascinates with the obscure views to reveal the moments, and brings properties to a trusted environment (Figure 5). The power of these experiences is reached through



the creation of intentional and configuration in blending with patterns of Nature in Space and Natural Analogs (Brown et al., 2014).



Figure 5 The blending pattern of nature in space and nature analogs
Source: Siam Premium Outlets, Thailand

Conceptual design

The design method used in this study is derived from one of the framework principles and synthesized as the “**Connect**” concept with the aim to blend the diversity of natural patterns and the embedded of human natural habitat into the built environment as shown in Figure 6.

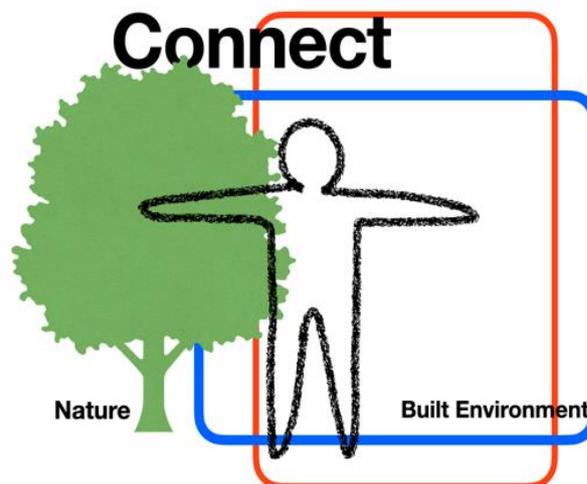


Figure 6 Illustration of the design concept: the blending pattern of nature into the built environment

To support the design and conceptual framework, the author began with the chosen design elements illustrated as shown in Figure 7. The round shape (A), the wave point (B), and the repetition of various lines (C) are the simplifying pattern and rhythms representing the similarity from nature for the screen design.

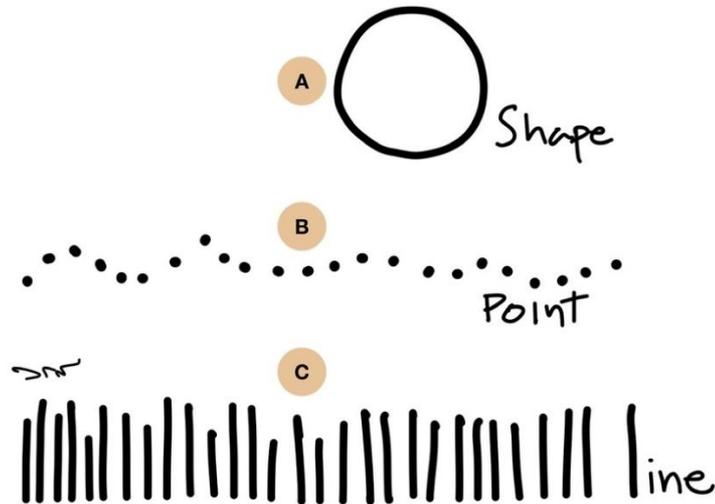


Figure 7 The chosen illustration sketch representing the simplification of elements from nature

4.2 Design development

Based on the design framework and conceptual design elements, the author had extracted the information to become the modular screen design to use in the workspace with the key message “Connect with Flexibility.” Figure 8 shows the initial sketch design of the screen in top and side views starting with points connected to form a semi-circle (top left). The top right sketch shows the side view of the screen that used repeated vertical lines in different heights for a small meeting where people can connect or discuss with each other at work (Figure 8A). The lower left shows the screen as an individual desk for focusing on the task (Figure 8B). This design represents the rhythm in the blending pattern of nature from the design elements.

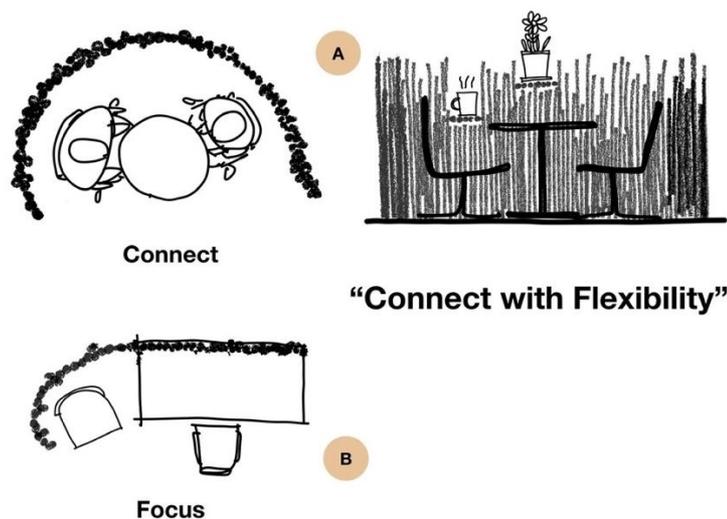


Figure 8 Sketch design illustrate the modular screen flexibility form,
(A) Top and side views of connecting at work
(B) Work scenario for focusing on the task



Figure 9 shows the initial sketch of the main structure of the screen that connected 2-3 inches diameter cylindrical paper tubes (left) using an elastic rope. The tubes were threaded and knotted one by one to form the screen (right).

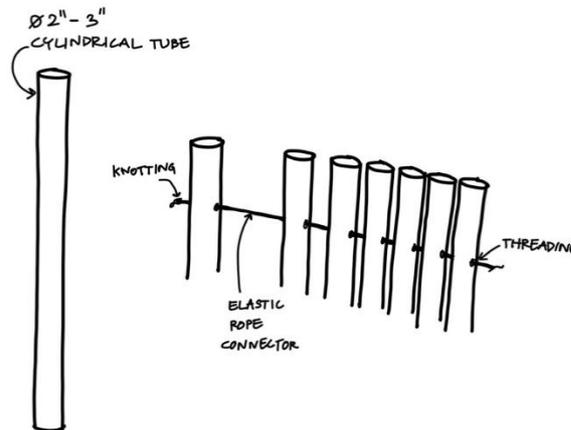


Figure 9 Sketch design illustrate the connecting techniques used to form the main screen

Materials selection

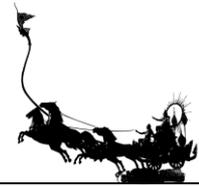
From the conceptual sketch design with the nature-based design framework, the use of natural materials was the primary source for this design in the design development process. Various sizes of recyclable paper tubes (Figure 10A) were selected as the main connection screen in which different sizes of the tubes represented the touch and the rhythm of nature. The elastic rope (Figure 10B) was used as a connector in which its elasticity reflected the flexibility of nature.



Figure 10 Paper tube material selection as a screen and elastic rope as a connector
Source: TS Paper tube (2021); Lazada Thailand (2021)

4.3 Prototype

The initial prototype of the “Free Flex” modular screen was made of 50 mm diameter with 5 mm thickness recyclable paper tubes with three different heights; 1000 mm, 1100mm, and 1200 mm, respectively. With this height, it can support the semi-privacy and encourage the user to focus on the task during work, taking into account the seating level as described in section 4.2. The black elastic rope connector threaded the tubes one by one at 200 mm from the bottom. The screen enables flexibility and curvature adjustment.



Both ends were knotted to support the series of the tubes. The rhythm of nature can be designed under a variety of heights of the tubes as shown in Figure 11.

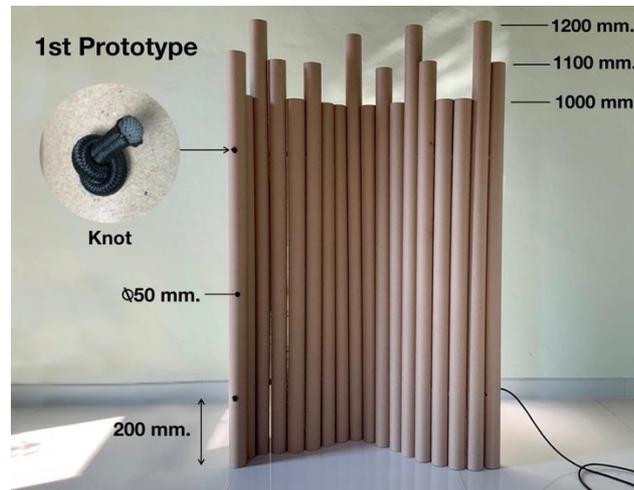


Figure 11 The prototype of the screen made from different heights of paper tubes and a black elastic rope connector

The system

From the initial prototype, the author had developed the system to make the screen more expandable. The system started from the main structure called “trunk” (A), which is a series of bigger paper tubes in both size and height, and the other screen was called “branches” (B), which is also a series of smaller tubes in different diameter, size, and height as compared with the trunk. To connect between the trunk and branches, the knot connector (C) and key connection (D) were developed. The key connection was designed like a keyhole and functions as a receptor in which the knot will be placed into the hole. Figure 12 shows a pattern connected between the trunk (A) and branch (B) using the knot connector (C) and key connection (D). It should be noted here that the connection between the trunks and branches should be harmonized by size.

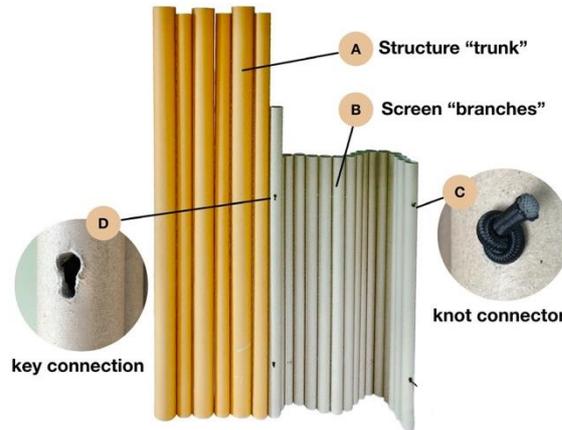


Figure 12 Flexible Screen system; Structural trunk, branches screen, knot connector, and keyhole connection

Figure 13 depicts the methods for connection and disconnection between screens. Figures 13a-c show a sequence of the connection method by handling the knot connector (C) with 2 fingers and then grabbing and inserting it into the top part of the keyhole receptor (D). The closed-loop of the screen is succeeded by pressing the knot downward in the keyhole receptor (D), which will fix the knot and interlocked between tubes (Figure 13c). To disconnect, the knot is grabbed and moved up (D) to release the knot from the keyhole receptor (Figures 13d-f). These techniques provide the adjustment and flexibility, including the expansion of screens as required for a variety of purposes of work.

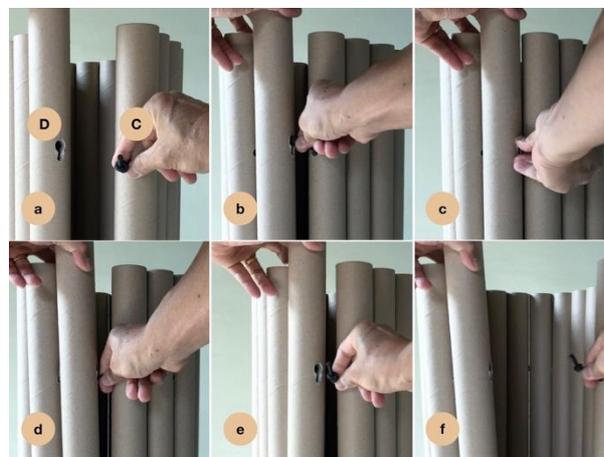


Figure 13 The connection and disconnection method using knot connector (C) and keyhole receptor (D)

Final prototype

From the initial prototype and system, the final prototype was developed on a larger scale, in terms of bigger sizes and heights, to work in the broader usage work scenarios as well as the pattern and color mimicking from the nature design framework (Figure 14). In Figure 14a, the screen was designed under harmonization of the tubes with diameters varying from 60 to 250 mm. The screen height was gradually increased up from 250 to 1750 mm. The purpose was to expand the functionality to a larger extent; for instance, the collaboration meeting or presenting. Figure 14b shows the randomly nature-based design patterns in perforated cut throughout the tube to create the visual dimension. The color touch was combined to create the sense of nature with the texture painted in a green tone as shown in Figure 14c. Figure 14d illustrates the final prototype, which is the combination of all conceptual designs.

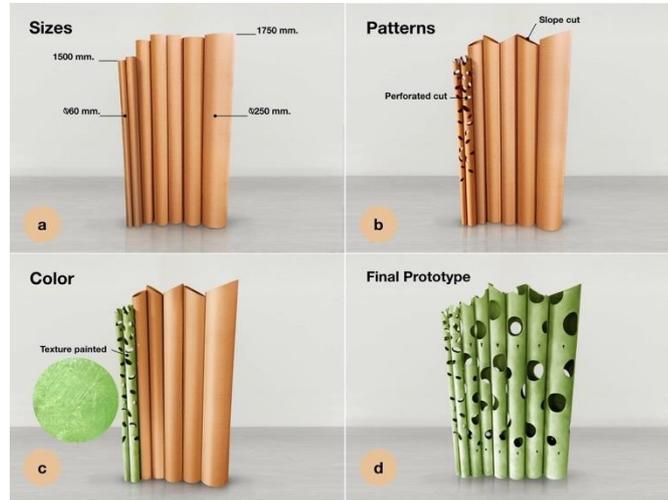


Figure 14 The final prototype in the design development process of sizes, patterns, and colors

Figures 15a-f show sequential photos shot of the actual screen prototype connected in a variety of patterns. The modularity in different forms expresses the key message of “Connect with Flexibility,” which gives an idea of how it can be applied to the workspace in the next section.

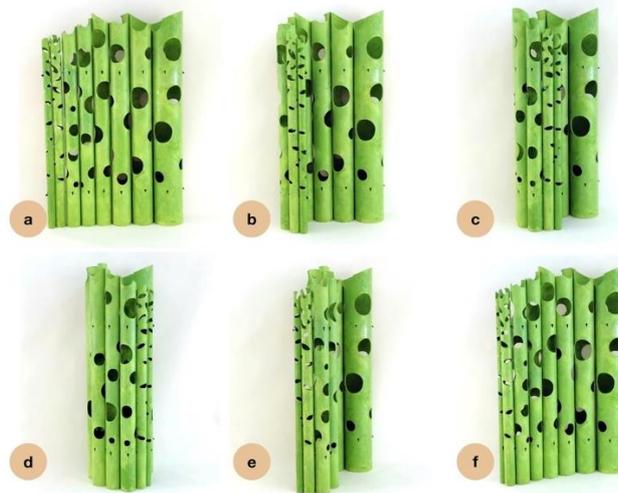


Figure 15 Sequential shots of the prototype connecting and flexibility

The first example of the application of the design is shown in Figure 16. The rigid environment at work stated the conventional office where all the workstations with the screens are fixed in place (A). The flexibility of the work station (C) can be incorporated into the center providing the contrary workplace of the present-day, which is the key to the good workflow and may lead to higher productivity of work.

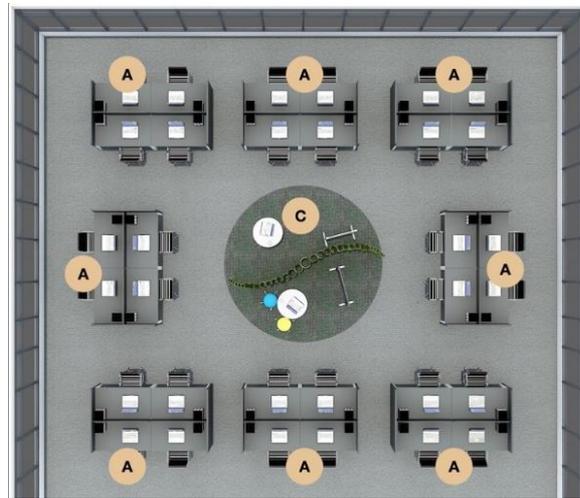


Figure 16 The combination between the rigid traditional workstations (A) with the flexible workstation (C)

The second proposed workspace was designed using a completely Free Flex screen in various function scenarios; a discrete single workstation (A) that provides the distancing during pandemic concurrent and an individual focus station (B) that composes a table and a stool. There are two choices of B. The first is presented at the middle top of Figure 17 in which the round table and stool support the official work by one user. The other B provides the casual style by lounge seating with individually preferable choice, presented at the lower right of Figure 17. Both A and B are for the concentration mode of work where C serves the collaboration among users for connecting and sharing ideas among them.

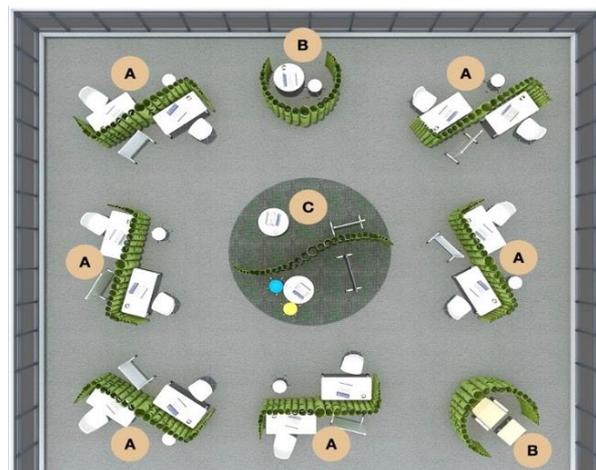


Figure 17 The demonstration of the application of Free Flex screen in various functions of the workspace

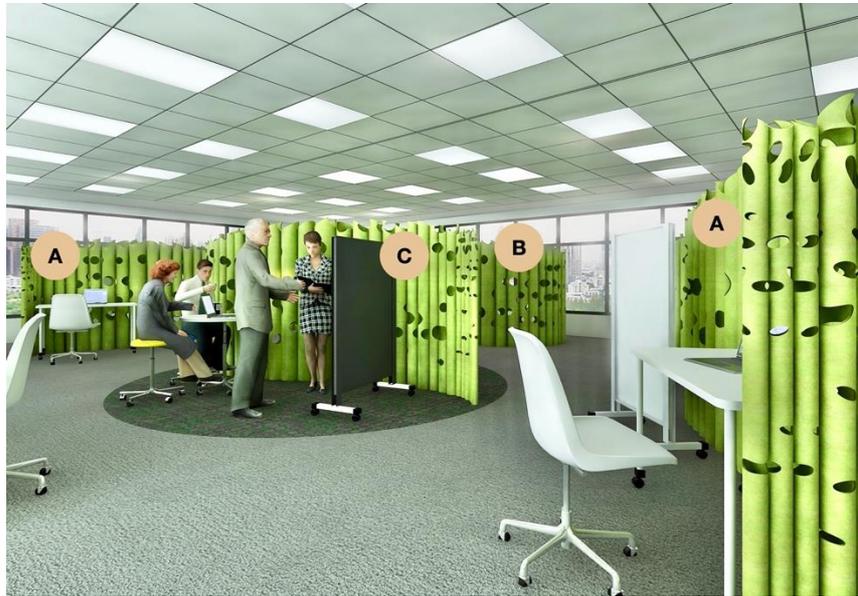


Figure 18 The 3D-rendering shows the perspective view of Free Flex screen (A), (B), and (C) in the workspace

The perspective 3D rendering demonstrated the idea of how the Free Flex screen system visual in the work scenarios (Figure 18). The axonometric view shows overall planning environment expresses the organic pattern to create a nature of the space atmosphere in the rigid workspace surrounding (Figure 19).



Figure 19 Axonometric view shows Free Flex screen (A), (B), and (C) supporting the nature of the space atmosphere in the surrounding rigid parameters

These designs aim to enhance good health and well-being at work with different perspectives to encourage people to get connected to nature in the represented analog form. The screen will offer the



flexibility to fit several work functions as previously described. One feedback that the author received from the test with the user was the weight concern of the tube in the bigger and higher sizes to move and rearrange in the different form. From the author's point of view, this can encourage the user to have a good exercise at work after a long period of static workstation seating.

4.4 Feature for further study

Taking into account the currently common communication during work, noise and voice can sometimes disturb other groups. Therefore, the author added some features to help reduce the noises using the acoustic spray painted to absorb sound into the inner surface of the tube screen (A) as shown in Figure 20. Another feature is the small pod (Cactus) plant holder (B) and utility holder such as marker pen (C). The holder was designed by inserting the smaller sizes of the paper tube into the selected tube branch with 200 mm in length at a 30-degree slope with the circle perforated cut in the middle of the tube to be the holder. This feature design may help provide the acoustical absorption of the noise in the open-plan workspace to reduce distraction (A), perform as the representing of tree branches and holder to increase visual of the nature of the space (B), and encourage team collaboration at work (C).

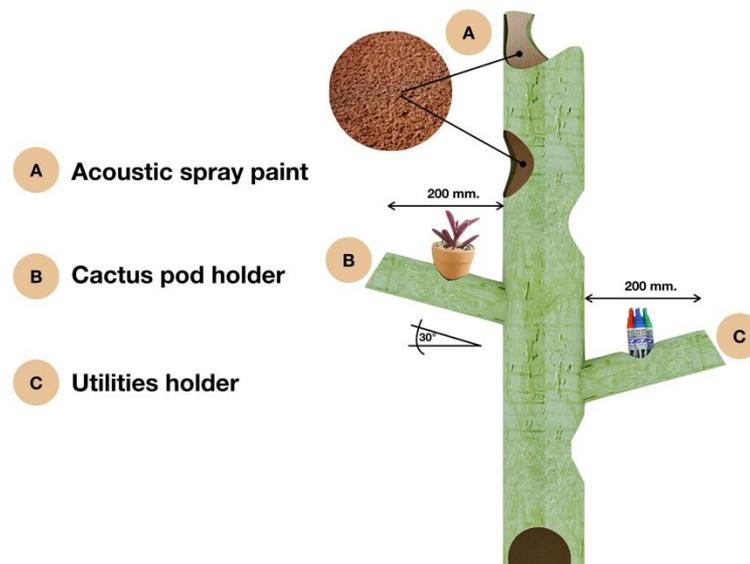


Figure 20 Additional features; (A) acoustic spray-painted, a small plant (B), and utility holder (C) with the paper tube

5. Conclusion

This study started with the question why do we easily get stress at work? What are the causes and how can we explore some design tools to help relieve stress in the workspace? The research found that an important reason is a disconnection from nature that causes stress since we are biologically innately connected to nature, which is our natural habitat. This problem inspired the author to seek tools to improve well-being at work. The author had studied the nature-based design framework as a criterion and sorted the most related principle to use as the methodology. The extracted results were the prototype of the privacy screen design fabricated using recyclable paper material blending with the natural pattern in the work environment to help relieve stress. Ultimately, this design aims to offer better mental and physical health to the new generation in the work context and leave some room in the design to urge their creativity and flexibility, which are crucial in the future of work.



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