Where design meets acoustics

Part I: How design can impact the workspace experience

Sounds Beautiful

Rockfon

Rockfon Whitepaper 2022.

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Part 1: How design can impact the workspace experience.

Contents

The history of interior office design is one of consistent change and diversity. Interior office design trends have ranged from noisy, open-plan workspaces to claustrophobic cubicles.

Throughout this evolution, space, light, and texture have formed the key elements used by designers. How these elements are used has a significant impact on the acoustical properties of office spaces.

At the same time, there has been a shift away from traditional brick-and-mortar construction methods in the mid-twentieth century. The introduction of sustainable materials, easily pulled apart and rearranged, has given designers new creative options. These materials bring a greater degree of flexibility to interior design, allowing designers to reconfigure spaces with ease.

In part 1 of this whitepaper, we'll explore the rich and diverse history of interior design for offices. Next, we'll dive into the core design elements that guide interior designers when creating new and innovative spaces. Finally, we'll see how these considerations are shaping contemporary interior office design and acoustics in the modern workplace.

"Where form follows function, acoustics follows activity."

— *Pascal van Dort, Global Acoustics Ambassador*

From Taylorism to open-plan office environments

A short history of office layouts

When we think of the office, we typically picture a workplace environment rooted in the twentieth century. Yet the office is much deeper-rooted in history, with its evolution spanning centuries rather than decades.

Our present workplaces continue to move forward in creative new directions. People, health, well-being, and technology are all driving forces behind these transformations. Furthermore, the close link between design and acoustics is vital in propelling these changes forward.

Therefore, it's worth considering where we've been before to comprehend where we are now.

Let's take a deeper look at how the idea of the workplace has changed, and how design and acoustics have collaborated to improve office environments. From the early examples of Renaissance offices to the twentieth century, these trends have shaped how we work.

400AD: Officium—The older root of "Office"

The word "office" can be traced back to the name of the staff who worked for high-ranking people in the Roman Empire, such as governors. They were known as "officialis", taken from the word "officium".

The first instance of the English word "office" came in 1395. Here it retains the association with civil servants and the spaces in which they worked.

1581: The Uffizi—The earliest purpose-built office in Western culture

The Italian Renaissance was a period of exceptional creative activity, with the House of Medici[1]. They used their immense wealth to finance iconic buildings in Florence, from the Basilica of San Lorenzo to the Palazzo Medici.

In addition to their stunning contributions to architecture, the Medicis were also responsible for the first office building in Florence.

The project took twenty-one years to complete and was the first true revolution in office work. Those who held a position in this building were among the privileged few.

It would take until the twentieth century before another radical change in the nature of offices occurred.

1906: Taylorism—The serial repetition of desks in open-plan areas

The turn of the twentieth century saw the arrival of office spaces in their contemporary form. Open-plan offices reflecting the hierarchy and rank of the organisation were introduced.

These designs were rooted in Taylorism, the management system that sought to increase efficiency. They did this by breaking down factory production into a series of specialised and repetitive tasks. Frank Lloyd Wright's Larkin Building is an excellent example of the style[2].

Taylorist office of the Division of Classification and Cataloging, 1937.

Wright explored the possibilities of light, space, and sound. His designs also used magnesite and a special "acoustic" plaster in everything from floors and stairs to partitions to enhance sound absorption.

Within the design principles used by Wright, the form of the building itself was to define its acoustical character.

1939: The streamlined office—Dehumanised and isolated place.

The destruction of the Larkin Building in 1939 coincided with a new emerging trend in office architecture. This signalled the steady dehumanisation of the workplace that was to characterise the mid-twentieth century.

These vast yet enclosed spaces, disconnected to the outside world, were evident in another design by Frank Lloyd Wright, the Johnson Wax Building. Here, Wright incorporated novel components such as artificial lighting, air conditioning, and heating, creating an environment where efficiency was paramount.

Additionally, cork ceilings and rubber floors were used to control the indoor acoustic environment[3].

Osram HQ in Germany, 1965 (Photo: Heinrich Heidersberger).

Office space of the Johnson Wax Corporation Building

1960s: Bürolandschaft—German for "Office landscape"

By the early 1960s, office design began to shift towards a focus on social layouts that encouraged their occupants to connect and engage. The Bürolandschaft[4] movement, led by brothers

Wolfgang and Eberhard Schnelle of the Quickborner, set out to create more interactive workspaces. Desks were now clustered in groups rather than endless rows extending into the distance.

Bürolandschaft pioneered open-plan office designs with clear zoning while introducing new challenges to acoustics. At the same time, new ceiling products with good acoustical properties were being manufactured. Not only was the form of the building adapting, but the materials used to define the acoustical character of the space were changing too.

1967: The action office—The need for freedom of movement

This evolution of office design, from wide-open spaces to closed-off clusters of desks, continued into the late 1960s. The introduction of the Action office epitomised this new style.

These territorial enclaves took office design closer to the cubicle farms that characterised the workplace of the 1980s. They were populated by what the pioneering modernist designer George Nelson called "corporate zombies" [5].

Typical office landscape: HQ of BMW in Munich 1972.

1980s: The cubicle farm—Profitability at the expense of working conditions

In the 1980s, many people feared that the rise of cubicle farms would lead to territorial enclaves dominating offices. This fear became a reality as cubicles became more common.

These offices were widely considered to be one of the most depressing periods for office workers. The emphasis placed on efficiency and productivity led employees who worked in cubicle farms to feel trapped within their surroundings.

21st Century: Collaborative office spaces—The humanisation of the workplace

The cubicle farms of the 1980s were something of an overcorrection from the spacious offices of the 1950s and 1960s. The collaborative spaces that shaped the twenty-first century saw designers reverting to a happy medium.

Office workers were freed from these restrictive cubicles, moving into contemporary open offices full of light and air. Spaces for collective interaction and socialising have become the norm.

The rise of hot-desking created a more flexible work environment as well as cost savings.

At the same time, this opening up of space created new acoustical challenges. This problem needed to be solved by addressing the largest free surface in the room: the ceiling.

Now: People-based offices—Office design for well-being

Today, office spaces are being designed with an emphasis on comfort and well-being. Natural light combined with a biophilic aesthetic sensibility allows designers to work with space and texture. When combined with well-designed acoustics, a sense of calm is maximised where employees can focus and deliver the best results.
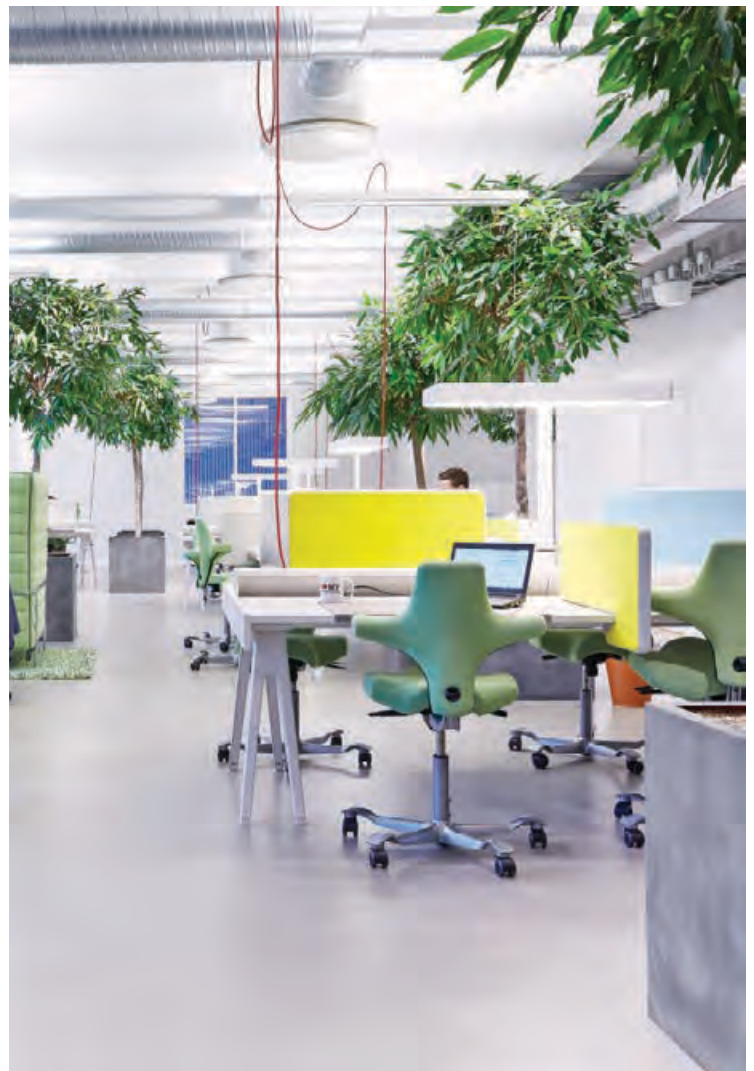
The modern office as more open and flexible (Lysgården, Trondheim, Norway).

The impact of interior design

How design and acoustics are linked

Great architecture and interior design require a balancing of two very different sensibilities. It simultaneously obeys the laws of physics and acoustics. At the same time, it taps into creative artistry that works to shape harmonious spaces that increase positive sensations.

The 7 elements of design

These sensations are the product of the seven core elements of design: space, lines, form, light, colour, texture, and pattern. We'll explore these elements next.

Space

Space is the foundational element of interior design, controlling the entire design plan. Throughout the design of any commercial space, the designer must be keenly aware of what space is available.

This includes its dimensions and utilities and how they interact with. This two- and three-dimensional space dictates the feelings the space evokes. This encompasses the floor's length and width, as well as the height.

Controlling the indoor acoustics environment already starts here. With activity based working the space should be separated into zones for different activities.

Lines

The horizontal, vertical, and dynamic lines that form the outline of a given space lead the eye into the room. This creates an effect of harmony, unity, and contrast. Horizontal lines are an effective way to evoke sensibility. However, when accentuated with vertical lines, they bring expressive elements into the design.

Lobby of Gensler & Associates (Tampa, USA). Dynamic lines prove the old adage "the devil is in the details", bringing a degree of idiosyncratic vibrancy when applied effectively.

Form

Form refers to the shape of the space, including the complete outlines and the objects used to add detail. Unlike two-dimensional elements that have a shape, three-dimensional elements introduce form, which can be geometric or natural.

Geometric forms are man-made, while natural shapes serve as a counterpoint, with organic and irregular lines found in plants. When combined, these create a harmonious balance of opposites.

Furthermore, the form of a space determines the sound waves' motion within it. Small, narrow, or round rooms should be noted. Parallel walls, domes, and faulted ceilings are also important considerations.

The placement of sound absorbing materials is critical in creating an optimized indoor acoustic environment in these areas.

Light

The use of light has a big impact on the mood of a space. Interior designers can use light reflection and diffusion to create the best lighting experience possible. This can be done by using natural and artificial light, as well as direct and indirect light.

The colour and texture of acoustical ceilings or ceiling components can also be changed to enhance the effect.

Open office Stålgården (Trondheim, Norway). Bright spaces with more natural light impact the wellbeing of its users.

From improved physical health to an increase in happiness, there is a broad range of natural light benefits in office design. These can help create a workplace where engagement and well-being can flourish.
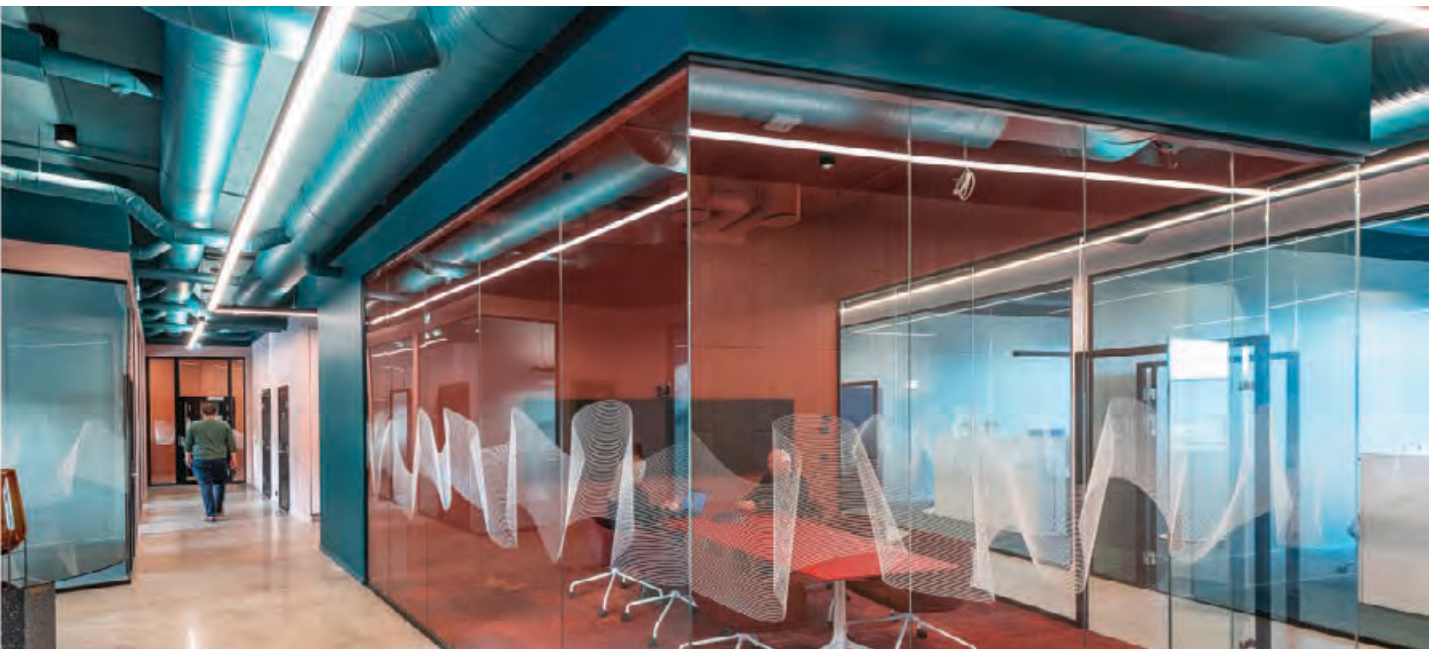
Colour

Using colour brings a room to life, by adding complementary and contrasting elements to the design"

Designers have a keen understanding of colour psychology to create the right feel for a room. The latest colour trends in interior design lean towards biophilic-inspired palettes that evoke nature.

67%

of office workers report feeling happy when walking into a bright office environment accented with colours[6].

Colour can make a meeting room more dynamic and spark creativity like in the Ramberg office (Sande, Norway).

Texture

The element of texture brings depth and interest, with designers using visual and actual textures to produce this effect.

Visual textures such as marble are in appearance only, whereas actual textures like velvet are felt as well as seen. Another advantage is that a coarse structure acoustically can optimise the diffusion of the room.

When used sparingly, texture brings more visual interest to interior designs.

Texture brings depth and improves acoustics in this Arkitekter AB meeting room (Gävle, Sweden).

Pattern

Another element that adds interest to a design is patterns. These combine lines, colours, and forms to create a sense of excitement and dynamism.
Many sound reflective materials like metal and wood can have a pattern with holes or slots so that it acts as a resonating sound absorber.

These repetitive decorative elements are another effective way designers can leave a signature touch on their interior spaces.

Design vs aesthetics

Our impressions and feelings related to the surrounding environment are rooted in our senses. When we see, hear, smell, taste, and touch, neurons are fired in our brains, creating a meaningful whole.

The most important of these senses is sight, through which we perceive up to 80% of our impressions. In comparison, the remaining senses become progressively less specialised.

When our surroundings embody a strong graphic representation, we can digest it easily. The best architects and interior designers are acutely aware of this fact when designing a building or space.

So what is it that makes a space or building well designed? Let's take a closer look at design and its principles, and how aesthetics plays a role in the process.

33%
of office workers say that the design of an office would affect their decision to work at a company[6].

Design

The basic description of "design" in the dictionary is "to make or draw plans for something". But expand that to "interior design" and the answer quickly becomes more complicated.

According to the International Interior Design Association (IIDA)[7], this is defined as follows:

"Interior design is the professional and comprehensive practice of creating an interior environment that addresses, protects, and responds to human need(s).

It is the art, science, and business planning of a creative, technical, sustainable, and functional interior solution that corresponds to the architecture of a space, while incorporating process and strategy, a mandate for well-being, safety, and health, with informed decisions about style and aesthetics."

Great architectural design has its own set of rules and values to consider. These can be traced back to the first century B.C. and the work of the Roman architect and engineer Vitruvius. In his multi-volume work, De Architectura[8], Vitruvius described three key attributes that all buildings should possess.

Vitruvian Design Principles
There were three design principles described by Vitruvius. These are:

☑ **Firmitas.**
Involves the notions of durability and firmness.

☑ **Utilitas.**
Relates to a building's utilitarian functions as a commodity that is useable.

☑ **Venustas.**
Relates to its visual appeal. When correctly embodied, this principle evokes delight and beauty.

Despite being over 2,000 years old, the Vitruvian principles are still quite relevant. This means that design should be durable, attractive, and helpful.

In the past, humanity sought to construct buildings that would survive for millennia. In contrast to current practice, when people are more preoccupied with utilising circular building materials that can be reused and have a shorter design cycle.

They are also interested in creating buildings with specialised functions and unique acoustical and light situations. Building material producers, therefore, must still develop long-lasting, beautiful, and useful materials while considering ever-changing design parameters.
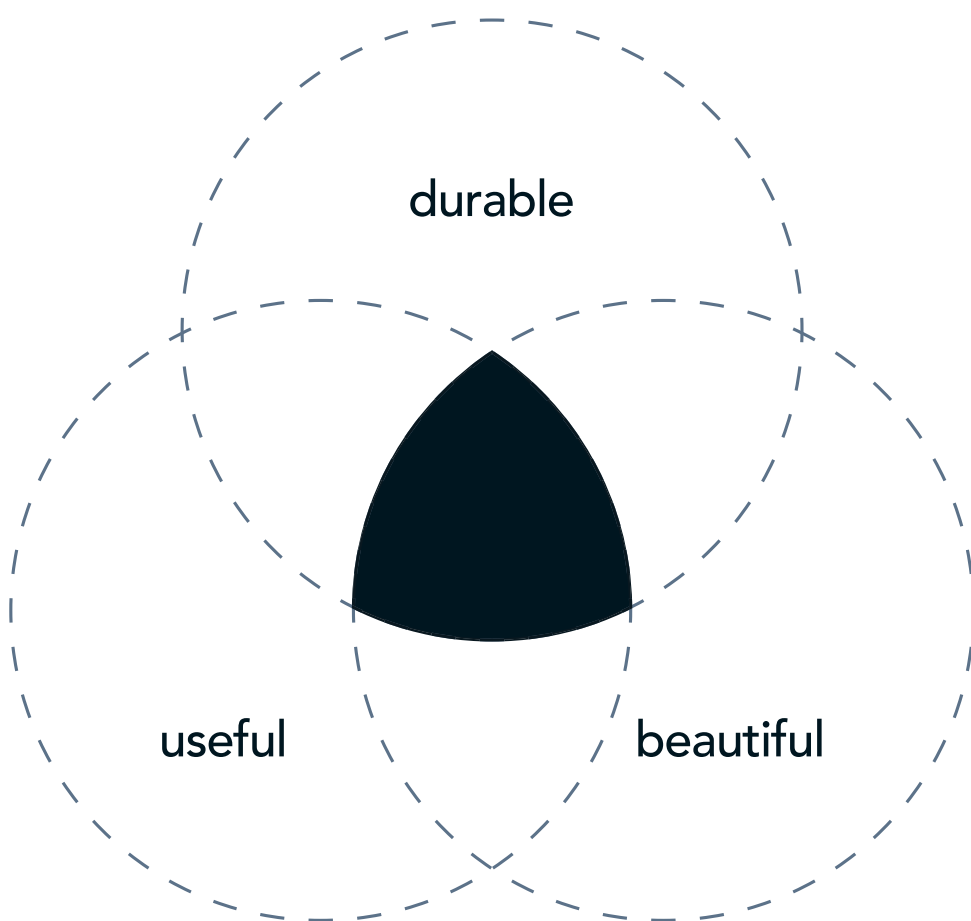

Figure 1. Great design is a combination of
durable, useful, and beautiful elements

Aesthetics

Aesthetics offers designers a continuation of venustas, the third design principle described by Vitruvius nearly two thousand years ago.

Derived from the Greek word 'αἰσθητικός', aesthetics relates to sensory experience. It was first used in 1735 by the German philosopher Alexander Gottlieb Baumgarten.

Baumgarten suggested that aesthetics transcends the beauty of art and touches upon our full sensory perceptions.

Of these senses, hearing gives us the ability to understand one another. Today, this definition has broadened even more to include our emotional health and well-being.

This embraces the environmental psychology of the Indian Vastu Shastra and the Chinese Feng Shui. This has become a central factor influencing workplace design today.

Durable, useful, beautiful elements make for well designed spaces in the Bialmed Corporate Headquarters (Pisz, Poland).

The influence of workplace design

Design for engagement, satisfaction, and well-being

Modern workplace design seeks to achieve a large range of outcomes, creating a space where employees can achieve high performance. Employee engagement and satisfaction also contribute to how design can promote well-being.

Interior design is focused on creating an emotionally gratifying environment in which health, well-being, and happiness may flourish. This has presented unique challenges for today's interior designers.

Furthermore, there's been a significant shift towards hybrid work. In other words, office design will need to be adjustable and adaptable to accommodate varied work styles.

85%

Of office workers say that the design of their office is important to them[9].

An improved acoustic environment in offices can reduce stress levels by **27%** and increase employee focus by **48%**[10].

This is to avoid constant renovation or waste of office spaces due to vacancy. Meanwhile, it also needs to reflect the company identity to attract talents and convey sense of belonging.

Finally, office design needs to address noise issues in office spaces to ensure an environment that enables people to work, concentrate and collaborate without being distracted. Let's examine some of these trends and how understanding them can help interior designers rise to the challenges.

Modern interior design: Data and insights

When investigating the impact of interior design on employee well-being, the data is abundantly clear.

Poorly designed workplaces are creating high levels of dissatisfaction and leading to increased employee turnover. Studies have shown that:

→   **16% of young people** (age 18-24) said that they left a job because of how poorly designed the office was[11].

→   **25% of people** say they want more breakout areas, where ideas can be discussed privately away from the desk[11].

→   **15% of workers** in an office environment with natural elements report a higher level of well-being[6].

→   **87% of workers** would like their employers to offer healthier workspace benefits[12].

→   **Rooms with higher ceilings** were more likely to be judged as beautiful than rooms with lower ceilings[13].

→   **Open rooms** were more likely to be judged as beautiful than enclosed rooms[13].

These findings have led employers to place a greater emphasis on the aesthetics of their office spaces. By fostering a more collaborative workspace, they are better positioned to attract and retain the best talent.

Natural elements report a higher level of well-being at Pandora's Global Office (Copenhagen, Denmark).

The human centric approach

Office building designs combining office spaces with residential and hospitality elements are leading to innovative approaches to collaboration and work.

The incorporation of biophilic design that mimics nature has led interior designers to rethink how they create spaces. Light, space, lines, textures, and colour are all considered when creating the future of the workplace.

Rethinking space

The contemporary office designed with a human-centric approach is one where spaces are more equitable, functional, and welcoming.

This means giving people the option of where they work, in spaces that allow them to move around freely. At the same time, this doesn't mean returning to the open-plan offices of the past. Rather, it means creatively using spaces that adjoin one another fluidly.

Different types of activities in a Spaces coworking office (Warsaw, Poland).

This means using an evidence-based design that values the interaction between occupants and indoor environments. Optimising the spaces available with a combination of design and aesthetics with the right acoustical comfort.

This creates an interior architecture that allows health and well-being to flourish. It also gives people a space where they can focus on delivering great work.

Emphasis natural light

Light and mood are intimately related, and natural light is the best way to create a mood that embraces biophilic design. There are a number of ways interior designers can maximise natural light in office designs. These include:

Seamless ceilings draw in natural light. Spaces (Warsaw, Poland).

→ Choosing a light colour scheme that allows for the reflection and diffusion of light;

→ Using skylights to allow natural sunlight to filter through to all areas of the office space;

→ Making adjustments to artificial lighting, such as overhead lighting and computer screens;

→ Streamlining the office furniture, as well as using lighter-coloured furniture to help increase the ambiance created by natural light;

→ Installing light wood flooring such as natural oak, maple, hickory, or ash;

→ Installing ceiling products that contribute to light reflection throughout the room.

Creating environmental control

The greater degree of control the occupants can have over their workspace, the easier it is to customise the environment to suit their needs. This means allowing them to adjust lighting at will, as well as control the temperature for the best work experience.

Creating environmental control also means designing interiors with acoustics in mind. When office spaces are created to balance work and quiet spaces to reflect or relax, getting the acoustics right is essential.

Using the right materials can help designers create this sense of separation from the various spaces in the office with dedicated uses.

Design for happiness, health, and well-being

The impact of well-being can be felt in a variety of ways[14]. This includes the medical costs a company accrues to the employees they lose due to burnout.

This means office design with a focus on well-being is a top priority for leading organisations. Designers must understand how the space is intended to be used. They can then balance light, texture, and acoustics to allow occupants to feel a connection to the workspace.

Architects must rise to the challenge of creating spaces that foster collaboration but also offer areas where employees can isolate themselves.

Well-being is intrinsically linked to sustainability. An increasing number of employees are looking for a workplace that respects the environment and uses resources efficiently. As a result, sustainability in construction is embedded in biophilic design, from the materials used to the supply chain and product recycling.

More and more work spaces are designed with a focus on well-being of the inhabitants.

Creating healthy spaces where hygiene is paramount

It goes without saying that the pandemic has created a heightened awareness of cleanliness and hygiene. The materials used when constructing office spaces play a crucial role in reducing the risk of bacteria spreading.

Building materials that focus on hygiene and cleaning help prevent the spread of harmful micro-organisms. This can help prevent infections and pneumonia. As a result, they can easily be cleaned and maintained without the need for fungicides and antimicrobials.

Mastering acoustics and sound

Office spaces can easily become an echo chamber of distractions if the acoustics are not carefully designed. Research shows that noise levels are important to 71% of the employees, yet only 33% find them satisfactory in their workplace[9].

The challenge interior designers face lies in creating flexible spaces that combine collaboration and privacy. They also need to keep distracting sounds to a minimum.

This means understanding the power of sound, and how surfaces impact its transmission from one space to another. Using materials that allow for sound absorption gives designers flexibility when creating dual spaces for collective brainstorming and individual concentration.

Interior designers are now using materials that effectively absorb sound through walls and ceilings. This helps reduce noise levels from one area to the next. This gives them the freedom to place single-person offices alongside communal spaces without having to worry about creating distractions.

To be continued...

This concludes the first part of the whitepaper about the development of interior design over the years.

Uniformity and utility have been cast aside in favor of new creative spaces and fluid design, maximizing the potential of acoustics.

The role of acoustics has become especially important, as interior designers shift from uniform spaces to multifunctional offices merging private and communal use.

As a result, new materials have come into play that help designers create separate but linked areas to overcome these challenges.

Stay tuned for part two, where we'll dig deeper into how interior designers are using acoustics to craft the best possible work environment for employees.

References

1   Wikipedia Contributors, "House of Medici." Wikipedia. Wikimedia Foundation. January 3, 2019. Link to page.

2   Wikipedia Contributors, "Larkin Administration Building." Wikipedia. Wikimedia Foundation. January 9, 2021. Link to page.

3   J.M. Syken (2013), PDHonline Course C819 "Frank Lloyd Wright and the House of Wax". Link to page.

4   Wikipedia Contributors, "Office Landscape." Wikipedia. Wikimedia Foundation. January 16, 2019. Link to page.

5   "George Nelson (Designer)". Wikipedia. October 12, 2021. Link to page.

6   "Human Spaces" (2015). Link to page.

7   IIDA. n.d. "What Is Interior Design?" Iida. Link to page.

8   Chisholm, Hugh, ed. (1911). "Vitruvius". Encyclopædia Britannica (11th ed.). Cambridge University Press

9   The Leesman Review, Issue 32 (2022), Link to page.

10 Sykes, David M., PhD. (2004) "Productivity: How Acoustics Affect Workers' Performance in Open Areas"

11 "Office Employees Want More Creative Places to Relax, Silent Rooms, Better Lighting and More Green Space." Business Review. October 15, 2018. Link to page.

12 "Custom Workplace Wellness Trend Report & Custom Workplace Wellness Market Research." n.d. TrendReports.com. Accessed June 20, 2022. Link to page.

13 Vartanian O et al. (2015), "Architectural Design and the Brain: Effects of Ceiling Height and Perceived Enclosure on Beauty Judgments and Approach-Avoidance Decisions." Journal of Environmental Psychology 41 (March): 10-18. Link to page.

14 Gallup, Inc. (2019), "Employees Need High Wellbeing for High Performance." Gallup.com. Link to page.

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