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OFFICE BUILDINGS THROUGHOUT CENTURIES VS NOW, IN THE 21ST CENTURY – DEVELOPING INNOVATIVE SPACE CONCEPTS

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Abstract
The paper seeks to define the principles of the development of office buildings throughout history, in the light of new research dealing with the needs and habits of a new workforce in the digital age and environment-friendly solutions. To start, we explore the evolution of administrative buildings through the ages, to see how workspaces were designed to accommodate work dynamics of the time and apply contemporary technological solutions. Afterwards, an overview of modern office spaces and emerging business practices aims to define the requirements and expectations put forward by a new workforce, predominantly tied to digital innovation. The resulting research's purpose is to design a model office space that considers both issues of sustainable building and the needs of the workforce

Keywords: **Office buildings' history; Co working; Digital age; Digital nomads; "Smart office".**

1. INTRODUCTION

A brief historical socio-economic overview

Every age is distinguished by a certain type of economy, a style of doing business and a pattern of development. This is foremost influenced by natural factors – geography and geology of a space, which were historically the significant factors in the distribution of wealth and power. Along wealth and power always came the development of economical science and production technology, with their appropriate architectural requirements and spatial planning. [1] To better understand current trends and fashion in the world of business, increasingly nomadic and independent of formal space, we must make a retrospective through significant events and timelines, rather than plain dates and persons, to grasp the big picture.

The first workspace we can consider shaped for that purpose can be found in the beginning of man's productive action. There must have been areas in the prehistoric caves and alcoves where man instinctively situated his tools and craft bench and proceeded to craft his tools and weapons, making that part of his living space a workplace, a workshop that in time, after invention of first letter systems became first offices. This was most likely a light place, guarded from winds and rain. These stations were mobile as was the community of hunter gatherers (hence we will return to this makeshift work-space later on). Soon the first permanently made settlements took over this role, such as the Neolithic houses at Lepenski Vir or Skara Brae.

As the landed, agricultural lifestyle developed, the diversification of work and later class came to be. An agricultural economy is very certain to develop a sur-

plus in goods, much more than one worker or family/commune can consume or store. This is where the first economic problem arises – storage. The solution can only be communal, a shared granary administered by a special clerk who keeps accounts of the input and expenditure. This newborn administration, a product of human co working requires its own specialized space, more importantly a permanent space – you can move a group of people, but you cannot move tones of grain. We can observe this organization in all ancient civilizations. Another important thing is the position of these storage buildings. They are often placed next to religious shrines or ruling palaces – centralization in small communities means safety and good management.

The rise of power requires a spread in trade and exchange of produces with other regions; it leads to strengthening of the mercantile and bookkeeping trade, which in turn requires a stable method of keeping accounts – a system of writing. The first mediums for this were dents on clay tabs, later traces of ink or coal on parchment. Both materials are susceptible to the sun, they wither and decay quickly under its rays. Because of this the first administrative spaces were made with very small, if any, windows, and thick walls, with good ventilation to keep moist out. Traders, even nomad caravans needed a space to show their wares, count their money and note their accounts. These spaces often doubled as temporary living spaces for the perpetually mobile traders (businessmen), which are especially the case in arid and inhospitable environments such as deserts, most notably in Persia. These buildings are known as Stoae, Basilicas, Caravanserai; their focus was on concentrating know-how and profit in key nodes, fixed on the great trade routes. The space itself was made by human measure, sometimes with the horse-drawn cart in mind as well. They were small, compact, with a considerable part used for storage of wares or accounting tablets/papyri. It is interesting to note that the modern principle of "hotelling" bears much similarity to this – the organization of four work desks with their needs, but on a grander scale, with auxiliary spaces included [2].

Until the Middle Ages, administration and business were mainly individual dealings, with a tendency for small units of collaboration – the precursor to guilds. New needs regulated the spatial plan, the building was fixed in its place, no longer could trade be mobile and the building itself underwent changes. Over the years a new storehouse was attached, a small counting room, a granary or smiting furnace. Medieval guilds developed the first "co working" space that would be such even in a modern context [3]. Guildsmen and their apprentices saw that their individual workspaces were quite large – the workbench with tools, the small furnace, large saw etc. – and that they do not occupy them all at once and that sharing the space can save time, space and money, increase overall productivity of a small group of 10–20 people. Common rooms became distinct, and the first glimpses of an open workspace plan could be seen, a plan flexible and easily changed by the workers.

Medieval craftsmen built their homes near the city centre; such was the case with elaborate guild houses as well. The goal was to bring the process of production as near as possible to the goal of selling to the populace, quickening the profit. These spaces formed city offices and the main characteristic of European cities – the enclosed square with marketplace and a well-developed front of facades, dotted with signposts, adverts and colorful ornament. The interior space is composed of an open plan on the ground floor and a mix of shared workspaces and individual bookkeeping offices on the upper levels [4].

In the heyday of medieval towns local production supplanted local needs and trade was conducted between the countryside and city in a balanced manner, the former provided raw materials and subsistence, the latter sophisticated tools, and ornaments. When the town started producing more than the populace needed in one aspect, and less than it requested in another, the era of colonial expansion and population boom after the 14th century plague led to broadening horizons of trade and business ambition. The guilds influence in the growing town pushed new contenders to the suburbs, where lower land rent and cheaper workforce coupled with the lower competitive pressure meant more profit, though not as much as the city-center. The opening up of trade routes, once commanded by Constantinople, after 1204 more and more in the hands of Genoa and Venice, brought in foreign wares of high quality, much cheaper than before, sometimes even cheaper than the local goods, since the manufactures of the east produced in much greater abundance. Slowly work and administration take different paths as before, with them the culture of buildings changes, first in Italy, the new hub between East and West [3].

The new dominants become various "Uffizi" and "Chancelleries", which take the form and organization of Greek Stoae and combine it with the multileveled guild houses. Internal organization is again based on a system of corridors with linear arranged

rooms along a common space. These rooms are usually used by small bankers and entrepreneurs. Their associations are no more local, they grasp a more regional style of business, and they start of as intercity relations and climb to be pan-European [4]. These small bankers are just representatives (satellite offices as we call them nowadays) of a wide society of pan-continental bookkeepers and traders, who keep tabs on the world market of gold and commodities. The advent of paper – a Chinese invention, which, unlike the clay tablet, does not wither and crack on strong sunlight, and the later development of local paper mills (started in the Spanish village of Xativa, utilizing Arab technology brought by the Moors, in 1150). Quick-drying ink, using oil as a solvent, rather than water and the printing press of Johann Gutenberg made documents more compact and easier to store, the offices could have large windows, a symbol of power as well. These associations of businessmen cover the whole Eurasian continent, the testimony of Ibn Battuta mentions such associations of Muslim traders spanning from Morocco to Malaysia [5].

Global trade of South American silver and gold, wheat from the plains of Russia and Ukraine, textiles and glassware from Europe for luxury goods such as silk, frankincense and spices from the Far East led to the founding of stakeholder businesses. The capacity of trade was too large for a single individual, and the risks it carried enormous, so the merchant speculators banded as investors into a single large venture where they all took the risk and divided the great profit. These associations were successors of the Cancelaria business organization, with a more advanced division into compartments – a group of small offices that each covered one segment of the business. As every office handles a separate part of business, their separation was welcome – the personal office became the new dominant element of organization.

On the other hand, production of goods developed to produce a greater quantity, which automatically meant more profit. The opening market crumbled old guild laws and regulations, and the large manufactories took their place, moving production to the outskirts and making their new rules. Adam Smith wrote of the efficiency of this new type of production – comparing a master blacksmith who can produce less than one hundred iron nails every day, after years of experience, to a group of five inexperienced craftsmen who, through division of labor succeed in producing more than a thousand such nails, without suffering in quality, for a lower wage and unit price. Manufactories production required the cooperation of more workers than the guilds of old employed, with a complex division of labor leading to specialized spaces for every step in the production process.

The two main branches of business intertwined and separated through history, often occupying the same space, in cohesion. Only after the great discoveries in the 15th century did the processes of production and business become diametrically different. Thus, it makes sense that they will slowly start reconnecting in further development.

This separation of sectors only could have survived in the context of small urban centers of the time, where a relatively small proportion of the population lived, specialized for administration and trade, surrounded by the countryside, the source of raw materials. Inventions of steam engines and railways considerably reduced the distance between town and village, thus lowering the cost of transport. However, paper, administration and documents were mobile resources. This means that for practicality the manufacture could be brought into the town, next to the bookkeeping and banks, connected to the countryside via railway. Together the two established the factory, for production and attached business office, for administration. The most important invention that made this possible was not the rail, but the perfection of clocks, and later implementation of the mechanism on the new workspace. Before the mechanical revolution man could not know time without the Sun, now the clock could show how much he works. Timesaving became an imperative – time is profit, and since one can only tell it, or rather lose it, with a wall or pocket clock, the clock shaped the workspace. The guilds of old worked as a team, with a respected interior hierarchy and regulated work hours so no member got exhausted or damage from overextensive work, much like the farmers, in the new factory hours gradually started to weigh more than the workers well-being, and it took centuries to return to a normal work day.

New inventions of steel framing and reinforced concrete construction, invented for the purpose of rail bridges and planters, made large constructive spans possible – wide production and exhibition halls, and tall administrative offices. The age of enlighten crystallized national identities worldwide and the view on a nation's character and history, it also led to a great division in business office typology on the two sides of the Atlantic.

Europe, with all its colonial domains continued the practice of low-rise corridor offices, built in the classicist manner, with linearly organized cell-like offices. The goal was to keep the dignified idea of the "European city" where the administrative offices are like ancient Roman temples, and the church towers have exclusive rights to the skyline (the baroque age research into Roman ruins concluded that high-rise buildings were only used as homes for the poor, since every European power wanted to legitimize as the heir of Rome, commercial high-rises were frowned upon by the intellectual elite).

On the American continent, where most buildings were made of wood (even today), the great fire of Chicago (1871) heralded radical changes. The devastation raised the question of a new fire-proof material. New land, once cleaned of debris, in the city center fetched a high price, other cities soon followed, as the United States recovered from the civil war and became a lucrative destination for business. The new solution for mitigating the cost of land was simple – to build taller. Ideologically this referred to the freedom of the sky, the soaring American eagle and new civilization. First the massive constructive system was tested but proved inefficient. Massive construction is composed of brickwork or stone masonry, heavy materials; to build tall walls on lower floors need to be of greater thickness than ones near the top, even more in the foundations. Soon it was discarded as too expensive. The new masonry high-rises showed an early attempt at an open plan, the main issue being retaining walls. The moment technology allowed it these walls disappeared. The change from masonry walls also opened the façade with more glass. Until the shift in constructive material, more light could be brought in by using the Chicago school windows, with only a thin strip of wall between two openings or bay windows which protruded from the façade outwards.

Simultaneously, the use of reinforced concrete and steel framing system made large spans of open space possible on all floors. Since the outer – façade – wall was no more retaining, there was no obstacle for more openings, something all Renaissance "Uffizi" strived towards. Tall ceiling heights complemented the light, resulting in spacious rooms, full of light and air. Interestingly, the first "skyscraper" was built in Europe – the Witte Haus in Rotterdam. A "mere" ten stories high, built with modern skyscraper design in mind, the interior still has two retaining walls obstructing the space, and a classical organization.

Europe got its first real skyscraper quite late, after the First World War – the Boerentoren in Antwerp, built in the 1930s, with steel frame and 88 m tall. The same way America skipped the low-rise administrative palaces, Europe soon overcame Art Deco skyscrapers with all their luxury and adopted the international style of glass and steel. As information technology developes, the space is divided into great halls, where clerks work in individual workstations in the giant open space, and the individual offices and meeting rooms. Depending on the businesses requirements the focus is shifted from private to shared space and vice-versa. The professional feel of a meeting in suites, with coffee and refreshments still dominates business ethics, the buildings purpose is only work, with the goal of profit [6].

The personal automobile is also worth noting, as before the war cars were still a luxury. After the war ended, many producers switched back to civil economy, and the weapons and armored vehicle plants had to be converted to something useful and make a profit. The surge in automobile production began in the 1960s when Japan and Germany joined the United States as lead producers. The automobile is key in the American dream story of success, where the successful businessman always drives to work from his peaceful home in suburbia, part of the dream is also in architecture – the office with a view as a great status symbol [7].

The development would probably had ended here, however, the Second World War brought innovation in two key aspects – first, large-scale and affordable air transport, and second the development of information technology. Both invented for military purposes during the war and developed after it so the extensive war-time industry stays active.

The benefits of information technology shined in the post war period. Automated work and faster information processing were cheaper and more efficient than professional accountants and craftsmen (comparable to manufactories replacing guilds). Oil exploitation continued on a larger scale after the war, which made a higher supply, in turn lowering prices, effectively making it cheaper to run a machine than to pay a skilled laborer. Office spaces had to be enlarged, the writing machine was large, but nowhere near a server room with all the required wiring. Connecting all offices became simpler after removing the partition walls – the steel frame made this possible long ago – and utilizing the work desks and shelving as flexible walls. Eliminating the interior walls caused a new problem – where will the wiring pass? The answer was either a false ceiling or a raised floor, through which the myriad of cables and ventilation

ducts could pass without disturbing the workers [8].

The new network office with its system of work required a much greater level of cooperation. A team from Hamburg conceptualized a new open space as the latest spatial organization, which would involve all employees in the work. The idea was parallel in the medieval guilds, where master and apprentices worked in the same space, helping each other, and communicating through at the day at work. After centuries of private offices, it seemed that this open plan suited people best and that everbody will be happier in this large team arrangement – reality is different. The psyche of most people (there are always exceptions) requires a time and space where one can think in peace and, sometimes literally, hear his thoughts. Even though the open space solves many issues, both technical and social, here it goes contrary to the old saying "There is a time and place for everything" (often used by Chinese philosophers like Lao Tse in the Tao Te Ching). Even new research from Harvard confirms this [9], still the open space remains as a generally accepted method of office organization today.

2. BUSINESS PREMISSES TODAY

As shown in the historical time-lapse, the evolution of workspace took a sinusoid path from the guild house to the open plan, however, the first link is missing – the cave. The primordial cave was home to ancient man, a shelter from the "evil" outside forces. It was a warm home and a workspace in one. Throughout history it is evident that important inventions and moments of innovation happened very often in scientist's homes, much less in their workspace. The key to fruitful creative work is a relaxed atmosphere, without constrains, the hustle of meeting deadlines or accomplishing something through pure effort. The cave was just that, a home, where one could detach from work and contemplate on design, rest at will and work until he finishes the job. [10] Perhaps Plato was right in using the cave in his story long ago.

Philosophy set aside, information technology developed during the war effort and in its aftermath, both as a weapon and as a deterrent. War has always been a powerful engine of invention and commerce. But not only is formal war an incentive to develop technology, but there are also "preventative" measures. In the current time of relative peace in the Northern Hemisphere, that inventive rapture and creation is no longer present [11]. Big corporations are slowly realizing that it is no longer possible to innovate by force; the freedoms they created for their own reasons have now reassured people and given them a strong stance against exhausting themselves for the sake of work. The workers mindset has changed drastically.

The development of technology has made the conference room unnecessary – now there is a conference call, that group seating is no longer needed – there are now online groups, that fax machines and landlines are slowly being phased out – because everything has become mobile and, more importantly online, in today's world, especially after Covid 19 pandemics happened [12, 13]. Global networking has expanded, server rooms have been set up worldwide and it is no longer important to work in a representative and magnificent facility, but to have original and free ideas and opinions.

Another factor is the high costs of space transportation and maintenance – energy is becoming more expensive, green solutions are slowly becoming cost effective, and a well-paid workforce is far less expensive than maintaining air-conditioned and illuminated space that is used only 40% of the day. An interesting fact is that office space with all its equipment per $1m^2$ consumes 5–10 times more electricity per month than a standard household, depending on the place [14]. The combination of all these factors, which are a direct consequence of historical development, has given rise to the new idea that office space in the present context is not always very necessary but also harmful under circumstances, i.e., cases like current Covid 19 pandemics, above all environmentally and financially. A large amount of energy is consumed to illuminate and cool the space where dozens of people and even more devices work, while the creativity of employees declines.

In this period, the greatest invention was the microchip, which has been continuously decreasing in size for half a century and increasing its power. The compression of the elements of a desktop computer made the invention of the first laptop in the 1980s and then of smart phones and tablets more recently. Administrative jobs could now be carried and worked in various places, without paper and a formal work desk, all cables, and shelves. In conjunction with the Internet, mobile devices have changed the standard of work and led to a change in office work consequently [15].

Today's office spaces, and spaces used as offices at home and elsewhere, can essentially be characterized as

1. Customized open plan
2. Co working
3. Outsource or satellite offices
4. Hotelling and Activity Based Working
5. Desk sharing, hot desking, and smart offices.

Common features of all spaces are:

1. Flexibility – a major feature of the new open plan, where the office can be rearranged in a myriad of ways to fit the customer
2. Collaborative furniture – Use of modular chairs and tables that save more space
3. Integrated technology "smart" solutions – rooms with screens on conference walls, integrated commands in chairs and the like
4. Biological interior design – application of wood, stone, generally natural materials, soft, relaxing tones, music at lower frequencies, nature imitations, many plants, feng shui design, etc.
5. Integrated relaxation and recreation rooms - most often impromptu bars and small gyms, the idea is that healthy workers work better, and that physical activity encourages mental activity as well, and health [16].

The goal of these spaces is to be as comfortable and warm as possible to resemble a home. Behavioral research has provided the main directions; companies only must adapt them to their style and message, which leaves room for infinite variations [17].

2.1. Customized open plan

This system adopts all the logical benefits of an open plan, but integrates more flexible space at the expense of fewer desktop computers. It creates a better work environment and cohesion of workers, usually designed for a specific company or set of companies that will stay there for a long time. Classic desks are getting more playful and there is more focus on laptops, while desktops are still in the space.

2.2. Co working

2.3. Outsource or satellite offices

The system is modeled on the information network itself. It implies that the workspace, which would otherwise be in one place, would be divided into several places to make it easier for workers to travel, reduce costs, bring individual teams closer to service users, or simply have the company register at a familiar downtown address. A more important aspect of this system is the global one, where from developed areas in which costs are much more expensive, the main part of the work is transferred to less developed ones (especially the countries of Southeast Asia and Southern Europe). Spatial organization is not significantly different from traditional offices, they are generally noticeably smaller and more suited to regular users.

2.4. Hotelling and Activity Based Working (ABW)

The name refers to the use of a hotel and motel as a workplace, but the two can be classified as casual coworking, and the true meaning is actually the use of a workplace like a hotel room. Statistics in the 1990s showed that the workplace was empty for most of the day, wasting electricity and money, especially in jobs requiring work outside the firm, in the field or in another city, such as advisers or workers in direct contact with customers. The satellite office system allows mobile workers to access the workplace in multiple locations, with the possibility of shutting down at any opportunity, only on condition that they are announced on time, as in a hotel. ABW goes a step further and offers employees different work and interview spaces at the start, thus inspiring them to move and interact with the environment, larger spaces are available and no announcement is required, it is just important to have a vacancy. ABW is a system operated by architect Clive Wilkinson who has several successful large-scale projects [18].

2.5. Desk Sharing, Hot Desking and Smart Offices

An idea reminiscent of coworking and hotelling. Desk sharing means a large space like the one in coworking that is pre-rented and contracted like in a hotel business, but the space is not owned by a business, it is accessible to everyone. This is also a way to save money on empty tables, only in a more organized way. Hot desking involves taking a table quickly, without notice and paying at the end, an expanded version would be "smart room booking" or "hot rooming" related to renting smart offices. Throughout the process, workers are shifted to the workplace as a conveyor belt. The broader picture would be Co-living, community living and work, where cars are shared, shared spaces dominate and

everything is done in groups, while privacy continues to exist in individual rooms. This is most reminiscent of old guilds and cooperatives where members lived and worked together, cared for one another, and yet retained all the benefits of privacy.

We conclude that throughout the entire historical development of business, there is a balance between administration and work, privacy, and sociability in the workplace. The relationship of opposing principles in the context of time and significant technological advances have led to the emergence of many spatial organizations that have emerged and disappeared over time, consistently improving over time. The true essence of a good workplace is a space where one feels at home, a place where one wants to work and create a future, where work is not a mere obligation to survive. This essence was lost in the time of the great boom of Europe, after the 14th century and in the historical altercation of European powers around the world, a time of perpetual wars, when the economy had to evolve to support the war efforts of the rulers. In this new age of peace, at least illusory, the idea of connecting home and workplace has returned and is undergoing transitional phases of flexible shared spaces, with an aspiration to work from home, where the internet takes over connections with others and live gatherings become part of leisure.

The future of office space that was already shown in Artificial Intelligence (AI) will depend on the next great invention that will allow for a radical change of workplace or its complete elimination.

3. APPLICATION OF THE MODERN OFFICE PRINCIPLES – GOOGLEPLEX, A NEW CAMPUS COMMUNITY, BY CLIVE WILKINSON ARCHITECTS. LONDON, UK

As the authors write, in early 2004, Google realized the inadequacy of classical office spaces for the new industry of creative software development [19]. The authors' concept was based on reevaluating the needs of the new class of office workers and creating a space for both concentrated work and productive, team building leisure.

Upon analyzing the existing campus, a master plan was drafted that incorporates the 3 unique environments and 4 buildings into a single entity. The existing buildings and constraints were treated as opportunities for innovation, and innovative design methods appropriate for a new style of office buildings. Even though the Googleplex is a genuine office building, the heart of a multi-national company, its master plan incorporates the language of a campus, akin to every university campus; it incorporates sports activities, learning, common areas and a park.

A primary vision was to merge the idea of workplace with the experiences found in an educational environment into a new way of working and maintenance of an edge [19]. In this the author sees the original concept of Google as a company, and henceforth the base for all companies who strive to the same goal of innovative business. One of the key elements of the office-campus is the idea of independent, self-directing work, either private, or more likely, as a small group. *For example, a lesson learned from Stanford University was that coding engineers worked best in groups of 3 or 4* [19].

This of course means more freedom, flexible work hours and personal management of break times, when the worker or team get too tired to think productively, they have a space for rest nearby, where they can develop their ideas away from the workstation. This way of passive problem solving, opposed to the strict active work hours of the past may as well be interpreted in the building itself – the main HVAC and power generation are also designed towards a goal of sustainability which usually relies on "passive methods".

To encourage the atmosphere of relaxed creativity the designers placed glass walls and white boards for notes and design expression – this way the workspace can follow the creative mind and new ideas can be marked on every step and debated with colleagues in a comfortable atmosphere. The use of smart diagrams, so called hot-cold diagrams of social concentration divided the environment into dominantly hot – public, active, available, and dominantly cold – private, for concentrated work, secluded from activity. This led to the development of 13 individual environments which the designers associate with the life on a college campus. Such an environment leads to success in both individual and collective development on the campus. After all the analysis the team transformed a typical office complex into a network of "neighborhoods" along a "main street" with common areas such as kitchens, libraries, dining areas connected both on the horizontal and vertical plan – through penetrations on the second floor. The work environments include individual open cubicles and closed rooms for teamwork, again much alike to those used at Stanford [20].

A design peculiarity can be seen in the treatment of "team officer" rooms, encased in colored glass to make the otherwise dull formality of a glass partition more vibrant to the surroundings [21].

4. CONCLUSION

Through history, the workspace evolved to incorporate contemporary technological breakthroughs, with the main goal being an increase of productivity. In the pursuit of efficiency, areas of the building without work-related purposes were shrunk in favour of more delegated workspace. The quality of the individual workstation diminished as well, leaving little for other activities. This in turn reduced the humane value of such workspaces, offices. Tall skyscrapers were deprived of access to their immediate social or natural surroundings. The lack of common spaces reduced much needed leisure gatherings of employees, which strengthen the work spirit and often yield positive results in work, to the spaces of fluctuating hallways, and the smaller individual office that lacks the capacity for even small collegial meetings. This all impacted the quality of work and productivity, and the results evidently led to a radical turn in the comprehension of such spaces.

For the new creative workforce, dependent on new ideas, rather than multiplying quantities, such office spaces were harmful. Companies with the resources and will to change, managed to adapt the classical workspace to suite the requests of this workforce, rather than box them in. The office had to embrace some values we find in the old guild houses, which make it feel more like home to the worker. Many new office skyscrapers have a vertical plan enriched with gardens and relax areas, small caffees and restaurants or even gyms, planted between individual offices and office floors. The office cubicles are often small, but partitions can be transparent and movable, the space can change as the workers see fit to improve their work. Principles such as Co-working and Desk sharing make the establishment of companies much easier for newcomers with innovative ideas and open the way for further connections of individuals and companies that conveniently occupy the same workspace for some time. The design of new office buildings hence must not only rely on the statistics and numbers that define sustainability, but also on the needs of the workforce that will occupy them. Only by sticking to both can architecture answer adequately to the benefit of all participants – the economy, the workforce and our natural surroundings.

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