Architectural and aesthetic aspects of workspace at home – a new design challenge in the age of pandemic

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Abstract. The article deals with the issues of spatial changes taking place in the office work environment during a pandemic. It also raises issues related to the space intended for work at home or in an apartment. At present, the traditional model of office work is undergoing significant transformations. These transformations include, in particular, the spatial aspect. Large office spaces, especially those of the open-plan type, do not work well during a pandemic, as it is difficult to keep an appropriate social distance in them. Therefore, we spend less and less working time, whether for safety reasons or the sanitary and epidemiological regime, for work in the office. This phenomenon is particularly visible in city centers, where many large office buildings have become deserted. We spend more and more time working remotely (home-office). Therefore, it is necessary to adapt the space of our houses and apartments to the conditions in which we live and work today. The very concept of remote work or work from home is not new, many companies have already introduced it before, but most often for a limited time, which in principle could take place without major changes in private apartments. However, the pandemic has forced office workers to work remotely full-time, and thus to organize a workplace in their own home. This is often associated with the need to introduce additional furniture, equipment or lighting to a private interior. The problem of many people working remotely is the lack of an additional room that can be used as a study or office. Then we are looking for a place for our home office in rooms that have so far performed other functions (most often a bedroom or a living room), trying to introduce a place to work with them as possible. The issue of acoustics is also of great importance here, especially when there are more people working or learning remotely in the house or apartment. Moreover, many, especially young office (corporate) employees, own one-room apartments in the studio type, in which it is not possible to separate such a room. Then we have to add an additional office space to the space that already serves several functions (living room and bedroom). The author is a researcher and designer of this type of space, and the cases presented in the article show the changes taking place in spaces previously perceived as typically private.

1. Introduction
In the era of the pandemic, many changes have occurred in our daily lives. In the workspace, which we have so far seen as a place where we change the world, which allows us to evaluate and develop [1], very dynamic changes are currently taking place. Large offices are emptying, and office work is moving to private houses and apartments, which are very often not adapted to it. Due to the imposed restrictions and social concerns, it is now common, basically regardless of the industry, to perform office work remotely. The transfer of the workplace to private space, to our houses and flats, apart from the obvious issues related to the psychology of work and the psychology of spending free time,
also affects many other areas, including architecture. This is all the more important problem that, according to a study commissioned by The Office Group (a company that designs and rents office space based in London) [2], published in the magazine Focus, we work much longer and more, and our work brings us less and less satisfaction. Almost 60% of the respondents blame it on the extended working time, which does not allow for proper regeneration and "cutting off" from professional matters. The respondents noted that the extension of working time and the multiplication of duties began with the transition to remote work due to blockades related to the coronavirus. For employees, the most burdensome are overtime hours, additional duties and a sense of constant activity, availability and, above all, the lack of space to work at home or apartment. This problem becomes all the more pressing when more household members are forced to switch to remote work and learning. In terms of architecture, it is the last of the doomed problems that seems to be the most pressing. Architectural issues, considered without the psychological aspect, can be divided into several problem areas, the most important of which seem to be:

- spatial issues - directly related to hardware requirements
- acoustic and spatial issues
- lighting issues.

2. The hardware – spatial problem
Various types of devices connected to the Internet can be used for remote work, but the most popular of them is undoubtedly the computer. A popular laptop does not take up much space, but in many cases a portable computer alone turns out to be insufficient. Depending on the specifics of the work, a number of other equipment is needed: a monitor (or even monitors), a printer, a shredder, a graphic tablet or surfacepen, a camera or speakers are just some of them. In addition, there is also equipment related to recording or making phone calls and storing documentation, because not everything can be stored only in digital form. Each of the above-mentioned elements is associated with certain spatial requirements, and if we do not have a space for them in our apartment or house - it takes away the space that used to serve a different function. In this way, we usually lose space for recreation, relaxation or eating. In addition, spending many hours in a sitting position requires an appropriate, ergonomic office chair, with the possibility of adjusting the angle of the backrest, seat height and depth or armrests, which we often do not have at home [3]. In practice, therefore, office work is most often performed on the dining table, and our office chair becomes one of the chairs standing next to it (often aesthetic reasons also determine the lack of an armchair - a significant difference in the external appearance of an office chair and dining chairs). Now, when it is already known that remote work is not only a temporary solution, but should be prepared for a longer period of its performance, more and more people decide to add furniture to their private space to create an ergonomic workplace. The basic piece of furniture is, of course, the desk - the size of the table top depends, of course, on how much free space we have, but it should not be narrower than 90 cm, and its depth should not be less than 60 cm, especially if we use an additional monitor.

The variety of available models allows it to be adapted to almost any arrangement of our apartment. The mere insertion of a desk, however, usually turns out to be insufficient, even if we add the comfort of an ergonomic chair to it. There are other issues to be solved, for example related to acoustics and lighting.

3. The acoustic - spatial problem
Contemporary, minimalist interiors are not conducive to acoustics suitable for work. Concrete so often used as the design of our apartments is characterized by one of the worst sound absorption coefficients of all materials, and the lack of furniture or fabrics in minimalist interiors does not improve this situation. Thus, reverberation is generated in our home workplace. But that's not the only problem. If we have a room in our apartment that can be used as an office, the situation is simple - we close the
door and create a home acoustic asylum. However, if we do not have an additional room, we are forced to create a workplace in the living room or bedroom (Figure 1, Figure 2). Each of these spaces is intended for different functions, but in each of them we will encounter the same problem - the lack of acoustic comfort, especially if we are not the only tenant of the house or apartment. Work performed in the living space takes this space away from other members of the household, and makes it difficult for the employees to concentrate and communicate. Even when we work using a headset, background sounds can be heard during teleconferences or on-line conversations. To avoid this, many people decide (often already at the design stage) to move or create a workplace to the bedroom.

If the bedroom is a separate room, acoustic comfort is achieved, but the psychological boundary between the workplace and the place of rest becomes blurred. This leads to the feeling of living in the "always-on" mode - that is, being constantly at work, and thus fatigue and faster burnout.

Therefore, in the era of a pandemic, as a response to acoustic problems that need to be solved, often with a simultaneous shortage of space, many solutions have been developed to suppress the workplace. The most popular methods used in our apartments, which have now also become our homes, are: the use of upholstery or curtains, upholstered furniture, plants and all kinds of pads. Information boards with soft underlays (cork) or office walls are also becoming more and more popular.

4. The lighting problem
The issue of lighting is also an important problem. Introducing a workplace to rooms with other functions often takes place on the basis of arranging the free space in a given room with the workplace. Standard office hours theoretically ensure that it is performed with daylight, but the amount of overtime and flexible working hours often mean that we are forced to work with artificial lighting. Moreover, the spaces, or rather their fragments in which "home workplaces" are set up, often do not provide enough light. In Poland, the intensity of lighting at the workplace is regulated by law [4]. Few people, however, are aware of these questions and questions about the workplace at home do not have an illuminance (Em) of 500, which is required for handwriting, typing, reading, translation, data processing, or assisted research planning computer.

However, it should be remembered that not only the light intensity is important, but also its color, direction, lighting distribution, reducing the dazzle effect, color temperature and the possibility of steering [5]. Another important issue is the face lighting itself during frequent videoconferences or webinars. The camera lens usually shows the trainer in a rather unfavorable light. Workstations are often located in such a way that the source of natural light (window) is behind the trainer, which darkens the image. Therefore, it becomes necessary to properly illuminate the face.
There are many models of lamps for specialized face illumination that do not cause glare and do not irritate our eyes. The most popular solution are ring-type LED lamps, popularly known as "ring" lamps (Figure 3). However, it requires a lot of space and mains power. The second type are lamps mounted above the unleavened computer screen, which take up much less space and can be powered by batteries (figure 4).

![Figure 3. ring led lamp](image1)

![Figure 4. lamp mounted on the computer cover](image2)

Natural daylight illumination can also be used by turning towards the window (Figure 1). However, looking at the brighter side for a long time tires our eyesight excessively and may also cause a reduction of concentration. The best solution, however, is to think about the workplace as a whole and to solve the lighting as the central upper or upper-side lighting, but with the appropriate intensity and ton temperature.

5. **Own design remarks**

Design experience shows that it is important to separate rooms for work at home. However, investors still devote very little space in their apartments and houses to this. However, changes in this regard are noticeable in the interiors designed in 2019 and 2020. 18 house and apartment designs from 2019 (Table 1.) and 22 residential buildings from 2020 (Table 2.) were analyzed.
### Table 1. Comparison of the space intended for the workplace in projects implemented in 2019

| type of building     | surface of the house / flat | lack of space to work | a place to work another zone of the house / flat | % of the area of the apartment | separate room for work (office) | % of the area of the apartment |
|----------------------|-----------------------------|-----------------------|-----------------------------------------------|--------------------------------|--------------------------------|--------------------------------|
| a detached house     | 240 sqm                     | (17 sqm)              | 7,08%                                         |                                |                                |                                |
| a detached house     | 175 sqm                     | (24 sqm)              | 13,80%                                        |                                |                                |                                |
| terraced house       | 182 sqm                     | (9 sqm)               | 5,62%                                         |                                |                                |                                |
| a detached house     | 160 sqm                     | bedroom (2 sqm)       | 1,02%                                         |                                |                                |                                |
| terraced house       | 116 sqm                     | (9 sqm)               | 7,03%                                         |                                |                                |                                |
| a detached house     | 128 sqm                     | (12 sqm)              | 9,23%                                         |                                |                                |                                |
| flat                 | 130 sqm                     |                        |                                               |                                |                                |                                |
| flat                 | 110 sqm                     |                        |                                               |                                |                                |                                |
| flat                 | 60 sqm                      |                        |                                               |                                |                                |                                |
| flat                 | 52 sqm                      |                        |                                               |                                |                                |                                |
| flat                 | 67 sqm                      |                        |                                               |                                |                                |                                |
| flat                 | 58 sqm                      |                        |                                               |                                |                                |                                |
| flat                 | 64 sqm                      |                        |                                               |                                |                                |                                |
| flat                 | 69 sqm                      | (11 sqm)              | 15,90%                                        |                                |                                |                                |
| flat                 | 59 sqm                      |                        |                                               |                                |                                |                                |
| flat                 | 48 sqm                      | bedroom (1,5 sqm)     | 3,12%                                         |                                |                                |                                |
|                      |                             |                       | 55,55%                                        | 11,11%                         | **av. 2,07%**                  | 33,33%                         | **av. 8,77%**                  |
|                      |                             |                       | - no                                          | - work place                   | - separate room for work       |                                |
|                      |                             |                       | place                                         | in bedroom                     | work                            |                                |

In 2019, a separate work room was present in 33.33% of projects. However, a complete lack of thinking about a place to work at home could be observed in as many as 55.55% of the developed projects. This coefficient remains virtually constant regardless of the type of development. In 2020, only 31.81% of residential premises did not have a separate workplace. There is also an increase in the introduction of separate rooms - 40.91% of projects already had them. At the same time, the area allotted for this purpose also grew. The percentage here is 10.21% of the total living area. However, this is still a slight increase.
Tabel 2. Comparison of the space intended for the workplace in projects implemented in 2019

| Type of building | Surface of the house / flat | Lack of space to work | A place to work another zone of the house | % of the area of the apartment | Separate room for work (office) | % of the area of the apartment |
|------------------|-----------------------------|-----------------------|------------------------------------------|-------------------------------|--------------------------------|--------------------------------|
| Terraced house   | 140 sqm                     |                       | (12 m²)                                 | 8,60%                         |                                 |                                |
| Detached house   | 150 sqm                     |                       | (16 m²)                                 | 8,00%                         |                                 |                                |
| Detached house   | 120 sqm                     |                       | (8 m²)                                  | 6,66%                         |                                 |                                |
| Terraced house   | 160 sqm                     |                       | Bedroom (4 sqm)                         | 2,50%                         |                                 |                                |
| Terraced house   | 110 sqm                     |                       | (12 m²)                                 | 10,90%                        |                                 |                                |
| Terraced house   | 125 sqm                     |                       | (14,5 m²)                               | 11,60%                        |                                 |                                |
| Apartment        | 320 sqm                     |                       | (25 m²)                                 | 7,87%                         |                                 |                                |
| Flat             | 80 sqm                      |                       |                                         |                               |                                 |                                |
| Flat             | 110 sqm                     |                       | (10 m²)                                 |                               |                                 |                                |
| Flat             | 70 sqm                      | Bedroom (5 sqm)       |                                         | 7,14%                         |                                 |                                |
| Flat             | 64 sqm                      |                       | (14 m²)                                 | 14,28%                        |                                 |                                |
| Flat             | 95 sqm                      | Bedroom (5 sqm)       |                                         | 5,25%                         |                                 |                                |
| Flat             | 63 sqm                      |                       | (8,7 m²)                                | 13,80%                        |                                 |                                |
| Flat             | 66 sqm                      |                       |                                         |                               |                                 |                                |
| Flat             | 50 sqm                      |                       |                                         |                               |                                 |                                |
| Flat             | 54 sqm                      | Bedroom (4 sqm)       |                                         | 7,40%                         |                                 |                                |
| Flat             | 78 sqm                      | Bedroom (4 sqm)       |                                         | 5,12%                         |                                 |                                |
| Flat             | 75 sqm                      | Bedroom (3 sqm)       |                                         | 4,00%                         |                                 |                                |
| Flat             | 63 sqm                      |                       |                                         |                               |                                 |                                |
| Flat             | 45 sqm                      |                       |                                         |                               |                                 |                                |
| Flat             | 38 sqm                      |                       |                                         |                               |                                 |                                |

In projects made for individual orders, we always try to provide a place to work, popularly known as the "home office". It is very often necessary to introduce it to rooms serving other purposes. This is usually a bedroom. These types of changes sometimes already take place at the design stage (Figure 5, Figure 6). Therefore, there is a resignation from additional room equipment, such as lounge chairs or dressing tables, in favor of desks, chairs of an appropriate height (but not necessarily adapted to many hours of office work, because here often aesthetic and psychological considerations are also at stake) and places for storing documents.
The increase in space in the bedroom area intended for the work area is clearly visible between 2019 and 2020. The percentage of bedroom area allocated to the work zone in 2019 was only 2.07% of the entire premises. In 2020, it was already 5.23%. Thus, it can be observed that the area of the workplace in the bedroom increased 2.5 times. This proves the changing needs in this area. It is estimated that in 2021 this indicator will increase even more, especially if we take into account the changes introduced to the already existing interiors, and they are frequent.

6. Case study – single-family house

However, if we deal with the existing interior division, or it is not possible to separate a separate room, the work space must be searched for in places intended for other functions. Solving the problem is made difficult by the fact that in many cases all household members work or learn remotely. Children's and youth rooms are usually separated rooms, which ensures a certain acoustic comfort, and their furnishings include, among others, desks that become places of remote work or study. The issue of remote work in common spaces, i.e. the so-called the day zone, where there is no suitable furniture or acoustic comfort, and the appropriation of this zone by a person working in it makes it difficult for other household members to use.

However, a large number of investors do not fully implement the projects, abandoning this element. In a single-family house located in Gliwice, the general renovation of which was completed in 2019, a place to work was planned in the bedroom (Figure 7). However, in order to maintain the "relaxing" character of the interior, investors decided not to implement it (Figure 8).
The changes that took place in 2020, i.e. a year after moving into the renovated house) and the need for remote work of all household members meant that it was added to the room in use somewhat “post-factum”. However, then most often the furniture is random and does not match the design of the entire room (Figure 9). We can observe that with time the number of elements on the desk increases, elements related to lighting and storage are appearing.

![Home office work desk and its evolution](image.png)

**Figure 9.** Home office work desk and its evolution (the photos were taken 2 weeks apart)

The workplace presented above stood exactly in the place originally intended, but in the design phase it was a place for short-term work, perceived rather as a place for a home command center, but now it is a workplace used for at least 8 hours a day.

### 7. Conclusions

The fact is that no matter how the workplace is organized at home, we start to get used to this way of performing our professional duties. According to the authors of the study published in Australian Psychiatry, in 2020 there was a 3% increase in booking appointments and a 7% decrease in absences from previously scheduled meetings compared to 2019 [6]. Each of us has individual preferences regarding the workplace. Research conducted in Great Britain shows [7] that some people, especially those who commute to work over longer distances, work more effectively in the work from home mode. However, the efficiency drops significantly when we take into account the group of people who looked after children during their work (both in preschool age and those learning on-line). This is directly related to the work space that we are able to create at home. On the other hand, however, as shown by the observations resulting from research employed in the IT industry [8], people who work remotely appreciate the possibility of being with children. A well-planned and organized workplace, the right amount of space, ergonomic furniture, appropriate lighting and acoustic comfort will certainly increase our efficiency. Therefore, it is worth paying attention to these aspects, because correcting them will undoubtedly increase our level of satisfaction and make it easier for us to face the long-term isolation caused by the Covid-19 pandemic.
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