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# *Transformation Design and Human-Machine Scale Adaptability of Office Furniture in the Post-epidemic Era*

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**Abstract:** In the post-pandemic era, the office environment has undergone profound changes, with flexible and remote working becoming mainstream work styles. With the diversification of working methods and changes in office space, the fixed design of traditional office furniture can no longer meet the needs of modern offices. This article explores the transformable design and ergonomic adaptability of office furniture in the post-pandemic era, focusing on how transformable design can improve furniture flexibility and space utilization, and the importance of ergonomics in furniture design. By analyzing outstanding office furniture cases both domestically and internationally, this article showcases innovative applications of transformable design and ergonomics, and based on user feedback, evaluates the effectiveness of these designs in actual use. The study found that the combination of transformable design and ergonomics can help improve the comfort, functionality, and adaptability of office furniture, but in practical application, it still faces challenges such as design complexity, stability, and personalized needs. Finally, the article looks forward to future trends in office furniture design, proposes development directions in terms of intelligence, personalization, and environmental protection, and provides theoretical basis and practical guidance for subsequent research.

**Keywords:** Affective computing; Intelligent voice interaction; Emotion recognition; Speech synthesis; User experience; Human-computer interaction

## 1 INTRODUCTION

With the outbreak and continuation of the global epidemic, the office environment has undergone unprecedented changes. During the epidemic, many companies and institutions quickly switched to a remote working model, which has led to unprecedented challenges in the layout of traditional office space and the design of office furniture. In the post-epidemic era, although people are gradually returning to the office, the traditional way of working is no longer fully adapted to the new needs. Companies are more flexible and diverse in their use of office space, and the design of office furniture has therefore ushered in a huge change [1]. In this context, office furniture not only needs to meet basic functional requirements but also needs to pay more attention to adapting to the needs of different working modes. Such as the transition of employees working in the office and at home, the balance between teamwork and independent work, and the integration of various office scenes all require furniture design to be able to flexibly respond to these changes.

The design of office furniture has long been more than just a simple arrangement of space

layout, but a comprehensive embodiment of comfort, functionality, health and aesthetics. With people's continuous reflection and reshaping of the working environment and working methods, traditional fixed office furniture has gradually been unable to meet the diverse and flexible office needs [2]. Therefore, the design of office furniture in the post-epidemic era is not just a continuation of the traditional single form of desks, chairs, filing cabinets, etc., but also a multifunctional, intelligent and flexible complex. Especially in the context of continuous space compression and increasing flexibility requirements, deformation design has become an important trend in modern office furniture. Furniture should not only be able to change its shape at any time according to needs but also be able to adapt to different users and meet diverse office needs.

This study aims to explore the design concept of office furniture in the post-epidemic era, focusing on deformation design and human-machine scale adaptability. With the diversification of office methods, the single design of traditional office furniture can no longer meet the needs of various office scenarios. As an innovative furniture design concept, deformation design can meet different work needs through flexible structural changes and provide more possibilities for office space [3]. At the same time, the importance of ergonomics in office furniture design has become increasingly prominent. The size, adjustability and adaptability of furniture directly affects the user's comfort and work efficiency [4]. Therefore, it is of great theoretical and practical significance to study how to make office furniture better adapt to the needs of different body shapes and different work modes through reasonable design. This not only helps to improve the work efficiency and comfort of employees but also provides companies with more flexible and functional office solutions.

## 2 CHANGES IN THE OFFICE ENVIRONMENT IN THE POST-EPIDEMIC ERA

In the post-epidemic era, the office environment has undergone profound changes. With the outbreak of the epidemic worldwide, companies and employees have gradually realized that remote work is not just a temporary measure for emergency response, but part of the future work model. The popularity of remote work has challenged many traditional office models [5]. Employees are no longer limited to the office as a single workspace but can work anywhere and at any time. This flexibility has greatly promoted the change of office concepts. Many companies have begun to adopt a hybrid office model, combining online and offline work. Employees can collaborate in teams in the office and complete personal tasks at home or elsewhere [6]. Since remote work is no longer a temporary transition period, but a part of corporate culture and working methods, the long-term and normalization of this office model requires office space design to be more flexible to adapt to different needs and changes.

With the popularity of remote work, the demand for flexible office space has also increased. Traditional office space is based on fixed workstations and fixed tables and chairs, with clear space divisions and generally a fixed layout that remains unchanged for a long time. However, in the post-epidemic era, the demand for flexible office space has become particularly urgent. Companies no longer rely on traditional office areas but pay more attention to providing employees with a variable office environment. These flexible office spaces not only provide employees with individual workstations but also need to be able to be adjusted at any time to support various work scenarios such as team collaboration, independent work, and video conferencing [7]. The design concept of this type of office space emphasizes the flexibility and variability of the space, and the furniture and equipment also need to have corresponding

adaptability. Such as the adjustability of office desks and chairs, the expansion function of conference tables, and movable partition walls are all key to achieving flexible office.

The multifunctional demand for office space has become an important trend in office environment design in the post-epidemic era. In the traditional office model, office space mainly undertakes a single work function, but with the change of work mode, the multifunctionality of space has become more prominent. Nowadays, office space may need to carry multiple functions such as office, social, rest, and collaboration at the same time, which puts higher requirements on the design of space. To adapt to this multifunctional demand, the design of office furniture must pay more attention to variability and flexibility [8]. Such as a conference table can be adjusted according to the number of people in the meeting and can quickly change from a small discussion table to a large conference table; a workbench can adjust the height and angle according to personal needs, which can meet the needs of sitting office as well as the needs of standing work [9]. In addition, space optimization and flexible configuration have also become particularly important. Office furniture must not only meet diverse needs but also maximize the use of limited space. How to integrate various functional areas within the work environment and maximize space utilization has become a difficult challenge for designers.

In general, the transformation of the office environment in the post-pandemic era requires us to re-evaluate the design concept of office space, with flexibility and multifunctionality becoming key factors. The adaptability and ergonomic adaptability of office furniture will directly impact on the comfort and efficiency of the office environment. How to integrate and flexibly utilize multiple functions within a limited space has become a key direction in office furniture design.

## 3 DEFORMATION DESIGN CONCEPT OF OFFICE FURNITURE

As an innovative furniture design concept, deformation design has received increasing attention and application in the field of office furniture in recent years. The so-called deformation design refers to the use of clever structural design to enable furniture to transform its form and function according to the needs of users and changes in the environment, thereby providing the best user experience in different situations. This design concept breaks the rigid model of traditional furniture, allowing furniture to adapt more flexibly to changing work environments, greatly improving space utilization and functional diversity [10]. With the continuous changes in work modes, especially the rise of remote work and flexible office modes in the post-epidemic era, deformation design has gradually become an important trend that cannot be ignored in office furniture. It makes the configuration of office space no longer limited to a single form. Furniture can automatically adjust or deform under different office needs to meet the diverse work needs of employees.

The application of deformation design has experienced a development process from traditional fixed furniture to flexible and adjustable furniture. In the initial office furniture design, furniture such as office desks, chairs and storage cabinets was fixed and basically designed according to standard sizes, which could not adapt to the needs of different users. With the gradual update of modern design concepts, especially the continuous improvement of people's requirements for the functions of office space, deformation design has gradually entered the field of furniture design. Such as desks can adjust in length to suit space needs, chairs can be adjusted to suit the user's size and needs, and bookshelves and storage cabinets can be reconfigured or folded as needed. Transformable design not only enhances the

functionality of furniture but also makes office layouts more flexible. The development of this design concept reflects the shift in office furniture from traditional static forms to dynamic, multifunctional, and adaptable designs.

Transformable design offers many distinct advantages, most notably space conservation and flexibility. In the post-pandemic era, many companies face limited office space, especially when shared workspaces are required. Efficient space utilization is crucial. Transformable design allows furniture to adapt to specific needs, allowing furniture with different functions to be converted with simple operations, significantly improving space utilization. Such as a desk can be extended or reduced to accommodate the number of people working; a conference table can be transformed into multiple small discussion areas as needed. This flexibility meets the modern office's demand for efficient space utilization. Transformable design also helps companies adapt to diverse work needs. Such as a single desk can accommodate long periods of sitting or stand-up work, improving employee comfort and efficiency.

However, transformable designs also face challenges, the most obvious of which is design complexity. To achieve the transformable nature of furniture, designers need to consider numerous factors, such as structural stability, the smoothness of the transformation mechanism, and the adaptability of the materials. Furniture must not only withstand the loads of varying use but also maintain functionality and stability during its transformations, significantly increasing the complexity of design. Furthermore, the complexity of transformable designs can pose production and cost challenges, as such designs typically require extensive engineering support and sophisticated manufacturing processes, increasing production costs and time.

In actual use, the convenience and stability of transformable designs also pose a significant challenge. While the adjustability and versatility of furniture provide convenience, the complex transformation mechanism can lead to operational difficulties, especially for users without specialized skills. Therefore, ensuring ease of operation while maintaining versatility is a crucial design consideration. Furniture stability is also crucial, especially when frequently deforming or adjusting furniture. Maintaining structural stability and safety to prevent malfunctions caused by improper operation are crucial issues that must be addressed in transformable designs.

Overall, the application of transformable design in office furniture offers more possibilities for modern office spaces, ensuring both spatial flexibility and adaptability to different work modes. However, achieving the maximum effectiveness of this design concept requires overcoming numerous challenges during the design, manufacturing, and use processes to ensure the furniture's ease of use, functional diversity, and structural stability.

## 4 ERGONOMICS AND SCALABILITY

Ergonomics, the discipline that studies the relationship between the human body and the work environment, plays a crucial role in office furniture design. Its core goal is to improve user comfort, efficiency, and health through optimized furniture design, thereby reducing the physical strain of long workdays. In the post-pandemic era, with shifts in office environments and work styles, the application of ergonomics has become increasingly important. In office furniture design, ergonomics not only impacts the design of furniture size, shape, and

functionality, but also involves adjusting the function and structure of furniture to suit different human habits and body types to improve work efficiency and reduce discomfort. The design of furniture such as desks, chairs, and filing cabinets should consider employee health needs, such as ensuring proper sitting posture, adequate height adjustment, and effective support for the back, neck, and legs to reduce muscle strain and eye fatigue during work.

The requirements for furniture dimensions vary for various office activities, and different work tasks require different sitting, standing, or other postures. Such as computer work requires an appropriate desk and chair height to maintain eye level with the screen and a comfortable elbow angle. Tasks like reading and writing may require adjustable desk angles and a desk and chair height suitable for writing. Comfort, adjustability, and versatility are equally crucial in meetings and collaborative work settings, especially when extended conversations are required. The dimensional requirements of furniture for different office activities extend beyond adjusting working postures to adapting to spatial layout and furniture functionality. Precisely adjusting furniture size and layout to meet the needs of diverse work activities has become a key element in modern office environment design.

Human-machine dimensional adaptability analysis is a further extension of ergonomics in office furniture design. Everyone has different body shapes, heights, and usage habits, and office furniture must be scalable to accommodate this diversity. Different body types have varying requirements for desk and chair height, seat depth, and backrest angle, especially during extended work periods. Such as taller individuals may require a higher chair back and desk surface, while shorter individuals require adjustable chair height and desk depth. Furthermore, people with larger or thinner builds have different requirements for seat width and cushion firmness. Taking these individual differences into account during design, ensuring furniture adapts to different users, has become a key aspect of modern office furniture design.

Office furniture sizing presents numerous challenges in practical applications. While adjustable features can accommodate users of varying body shapes and heights, ensuring stability, ease of use, and comfort for extended periods of use remains a design challenge. Adjustment mechanisms can become loose or damaged due to frequent use, or overly complex operation can make them difficult to use. Furthermore, overly complex adjustment mechanisms can significantly increase the cost of furniture, limiting its widespread adoption. To address these challenges, designers need to ensure that the adjustment system is simple, durable, and stable while maintaining the furniture's functional diversity, avoiding design issues that compromise the user experience.

## 5 DESIGN TRENDS OF OFFICE FURNITURE IN THE POST-EPIDEMIC ERA

In the post-pandemic era, office furniture design trends were characterized by diversity and a high degree of personalization. With the rise in remote and flexible work models, flexibility and adjustability have become core design elements. Multifunctional desks and adjustable chairs are becoming standard features in office furniture. To adapt to diverse office environments and usage requirements, furniture needs to be adjustable to provide a more comfortable experience for users of varying body shapes, heights, and work styles. Such as some desks not only adjust their height to accommodate sit-stand work but also adjust the

angle and size of the surface to suit specific tasks. Adjustable chair designs also prioritize back support, seat height, and armrest adjustments, allowing users to adjust various parameters of the chair to their comfort needs, alleviating discomfort from extended work. Beyond these common adjustable furniture options, the innovation and implementation of transformable furniture is also expanding the possibilities of office spaces. These pieces not only provide basic functionality but can also be quickly transformed based on space changes, usage needs, or work content, enabling flexible transitions from individual workspaces to team collaboration areas.

Closely linked to flexibility and adjustability is the ongoing advancement of ergonomic and comfort design. Modern office furniture must not only meet functional requirements but also consider user health from an ergonomic perspective. Customized design tailored to individual needs has become a key trend in office furniture in the post-pandemic era. Given the diverse body types, work habits, and health conditions of different employees, customized furniture can be fine-tuned to individual needs, providing a more ergonomic user experience. Such as for employees with specific health needs, office chairs can be designed with cushions that better fit their body characteristics and support the natural curve of the spine. For those who frequently use a computer, desk height and monitor position can be precisely adjusted based on the user's height and vision. This personalized design not only improves employee comfort but also reduces the discomfort associated with long hours at work, enhancing productivity and overall work experience. Furthermore, emphasizing a healthy and comfortable office experience has become particularly important in furniture design. Comfortable office furniture can effectively boost employee work enthusiasm and satisfaction, which is particularly crucial in the post-pandemic era.

With increasing environmental awareness, office furniture design in the post-pandemic era is increasingly focusing on sustainability and environmental friendliness. The use of environmentally friendly materials has become a key trend in furniture design. Designers are prioritizing renewable, low-pollution materials such as recycled wood, bamboo, and environmentally friendly plastics. These materials are not only environmentally friendly but also reduce the carbon footprint of furniture production. Furthermore, sustainability considerations in furniture design extend beyond material selection and encompass the furniture's lifecycle management. Many furniture designs emphasize modularity, disassembly, and durability to avoid single-use and waste. Furniture can be upgraded or replaced with components as needed, rather than discarded entirely. This sustainable design concept helps extend the furniture's lifespan and reduce waste. In addition to focusing on sustainable materials and structures, designers are also continuously seeking ways to integrate environmental protection with user experience, creating office furniture that is both ergonomically friendly and environmentally friendly. This is not only a concern for employee health but also a responsible approach to the planet's resources.

In summary, office furniture design trends in the post-pandemic era are increasingly prioritizing flexibility, ergonomics, comfort, and sustainability. As work styles change, the functionality and adaptability of office furniture have become increasingly important, while customization and environmentally friendly design are also becoming essential trends. These design concepts not only enhance the practical experience of office furniture but also respond to the multiple demands of modern office environments for health, environmental protection,

and efficiency.

## 6 CASE ANALYSIS

When analyzing the transformable design and ergonomic adaptability of office furniture in the post-pandemic era, outstanding office furniture examples from both China and abroad offer valuable insights and insights. Such as consider the "Zody" series of office chairs from the German brand Haworth. These chairs incorporate ergonomics and transformable design elements to accommodate users of varying body shapes. Their unique back support system adjusts to the user's back curve, ensuring the chair back can accommodate diverse body shapes and sitting postures. This design concept embodies the core principles of ergonomics: precise sizing to enhance comfort and reduce fatigue from long-term use. Furthermore, the Zody chair's adjustable armrests, seat height, and cushion depth provide a high degree of adaptability for employees of varying body shapes, ensuring that everyone, regardless of height, can work efficiently and comfortably. Another noteworthy example is the "Gesture" series of chairs from the American brand Steelcase. Designed specifically for modern office environments, these chairs adapt to varying work postures, making them suitable not only for extended periods of work but also for diverse work styles, such as touchscreens and keyboard input. Their designs consider employees of varying body types and diverse work activities, offering a high degree of adjustability and support, ensuring a comprehensive comfort experience for employees.

These examples not only demonstrate the technological innovation of transformable office furniture design but also highlight the importance of human-machine adaptability. A thorough analysis of these furniture designs reveals that their core design philosophy lies in combining ergonomics with transformable design. This approach not only accounts for differences in body types, heights, and work habits, but also allows for flexible structural adjustments to meet diverse office needs. Transformable design is fully utilized in these furniture pieces, such as adjustable tables and chairs, and modular components. These allow users to flexibly adjust the form and function of the furniture to their needs, significantly improving space efficiency and office comfort.

In the actual use of office furniture, user feedback and evaluation are crucial for evaluating design effectiveness. Many users report that the transformable design and ergonomics make their work environment more comfortable, especially when sitting at their desk for long periods of time. The adjustable features effectively reduce fatigue and improve work efficiency. Such as some users report that adjustable office chairs like the Steelcase "Gesture" chair can be quickly adjusted to suit their work needs, providing both comfort when standing and support for extended periods of sitting, significantly alleviating back and waist strain. Regarding desk usage, many employees also report that height-adjustable desks improve work comfort, especially when combined with sit-stand workstations. This not only enhances the work experience but also has positive health benefits. However, some users point out that in actual use, the adjustment mechanisms of transformable furniture can sometimes be inconsistent. Particularly with components that require frequent adjustment, they can become loose or difficult to operate after prolonged use, impacting the long-term experience.

Overall, the integration of transformable design and ergonomics has achieved remarkable results in practical applications, bringing unprecedented flexibility and comfort to office furniture. An analysis of outstanding office furniture cases from both domestic and international sources demonstrates that the successful application of transformable design and human-machine scale adaptability can significantly enhance employee work experience and health. However, further improving design stability and ease of use in practical applications remains a challenge for future office furniture design.

## 7 CONCLUSION AND OUTLOOK

Through in-depth research on the transformable design and ergonomic adaptability of office furniture in the post-pandemic era, we've discovered that office furniture design is evolving towards greater flexibility, personalization, and user-friendly features. In the post-pandemic era, with the prevalence of remote and flexible workspaces, office environments are no longer fixed and monolithic. Office furniture design must adapt to changing work styles and spatial needs. Transformable design has become a major highlight in furniture design. Furniture is no longer static or single purpose, but rather highly adjustable and multifunctional. Such as height-adjustable and movable desks and chairs, as well as transformable office space configurations, allow the office environment to be flexibly adapted to meet specific needs, maximizing space efficiency and user comfort. At the same time, ergonomic adaptability has become a key issue in furniture design. By precisely adjusting furniture dimensions to accommodate differences in body shape, height, and usage habits, office furniture not only improves user comfort but also reduces the negative health effects of long work hours.

Innovations and applications of transformable design and ergonomic adaptability in office furniture offer new solutions for the post-pandemic work environment. Modern office furniture not only meets functional requirements but also places greater emphasis on flexibility and comfort. Through modular, adjustable, and customized designs, office furniture can rapidly adapt and change to meet diverse needs and usage scenarios, providing higher work efficiency and healthier experience. When integrating personalized design with ergonomics, furniture design must not only consider the needs of individual employees but also accommodate diverse office activities, ensuring a work environment that better meets human physiological and psychological needs. Furthermore, sustainable design for office furniture is becoming a key industry development direction. The use of environmentally friendly materials and sustainable design considerations not only respond to global environmental trends but also provides companies with a healthier, greener work environment.

However, there are also challenges and shortcomings in the research and design process. While significant progress has been made in transformable design and ergonomic adaptability, practical applications still face certain challenges. First, the design complexity of transformable furniture, involving adjustment mechanisms, structural stability, and material selection, makes some furniture susceptible to wear and tear or difficulty adjusting after prolonged use. Second, while ergonomic adaptability improves furniture comfort, it is still difficult to fully meet the needs of all users due to individual body shapes and usage habits. Therefore, further improving the precision of personalization and customization in design is a key direction for future design.

Looking ahead, the design of office furniture in the post-epidemic era will further develop in the direction of intelligence, personalization and sustainability. With the advancement of science and technology, the application of smart office furniture will become increasingly extensive. Such as through sensors and artificial intelligence technology, furniture can automatically sense the user's body shape and working status and automatically adjust to the most suitable state. In addition, with the continuous development of environmentally friendly materials, future office furniture will pay more attention to environmental protection, durability and recyclability to ensure that the design not only meets functional requirements but also has a positive impact on the environment. Future research can further explore optimization solutions for deformable design and human-machine scale adaptability, especially in improving the stability of furniture adjustment, simplifying operational complexity and enhancing personalized customization services, to provide more practical solutions to meet the increasingly diverse office needs in the post-epidemic era.

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