

The Current Situation and Analysis of Human Factors in The Design of Mice and Keyboards Products: A Perspective of Ergonomics Design.

Minyu Wang

School of Southwest Petroleum University, Chengdu, China

Abstract

With the leaps in computer technology, human-computer interaction has become an important driving force in technological development. The design revolution of the mouse and keyboard, as key interaction tools, is crucial. With the increasing expectations of society for human-computer interaction, the human factors engineering concept is gradually popularized, emphasizing the humanization, comfort, and efficiency in design. This paper will analyze the design principles of the mouse and keyboard from a human factors design perspective, explore how they integrate human factors, and adapt to different user needs. At the same time, it will analyze the characteristics and trends of market products, and look ahead to future developments. This will help us understand human-computer interaction technology and provide reference for design innovation.

Keywords

Human-centered design, Mouse, Keyboard, Ergonomics, Human-computer interaction.

1. Introduction

In the rapidly developing era of informatization, computers have undoubtedly penetrated into every corner of people's daily lives, becoming an indispensable tool in work, study, and entertainment. Among them, the mouse and keyboard, as the core input devices of the computer, their user-friendly design, comfort, and ease of use directly affect the user's experience and work efficiency. Imagine working in front of a computer for a long time, if the design of the mouse and keyboard is not reasonable enough, it will not only affect work efficiency, but may also lead to a series of health problems, such as hand fatigue, shoulder and neck pain, etc.^[1]

To address these issues, the concept of human-centered design emerged. Human-centered design, in short, focuses on the user, emphasizing the consideration of human factors throughout the design process. Starting from human physiology, psychology, and behavior, products are designed to be more in line with human nature, easy to use, and enhance user experience. Guided by this concept, ergonomically designed products such as mice and keyboards have gradually gained attention and popularity.

Based on the human-centered design, both the mouse and keyboard not only focus on stylish and aesthetic appearance, but also achieve perfection in details. For example, the shape and size of the mouse are accurately designed according to the size of the human hand and gripping habits, and the keystroke feel and feedback force are also optimized according to the user's usage habits; the layout of keys, key sizes, key travel, etc. of the keyboard are also personalized adjusted based on the user's typing habits and finger lengths. These small design details are aimed at providing users with a more comfortable and natural user experience, thereby improving the user's work efficiency and satisfaction.^[2]

Therefore, based on ergonomic design of mouse and keyboard, which represents not only the cutting-edge trend in the current design field, but also an important direction in the development of computer input devices. In the future, we have reason to believe that with the deepening of the concept of ergonomic design and the continuous advancement of technology, the design of mouse and keyboard will be more humanized and intelligent, bringing more convenience and comfort to people's lives and work.

2. The Application of Human-Centered Design in Mouse and Keyboard Design

2.1. Dimension and Shape Design

In the digital age where efficiency and comfort coexist, the design of the size and shape of the mouse and keyboard, the two core tools we interact with computers on a daily basis, is particularly important. [3]In order to ensure that users can maintain the best comfort during use and reduce fatigue caused by long-term use, designers need to delve into the principles of ergonomics.

First, let's take a look at the design of the mouse. An excellent mouse design must ensure that it is of a moderate size, neither too large which would require excessive stretching of the hand, nor too small which would make it difficult for the fingers to operate flexibly. The shape of the mouse also needs to be carefully designed to naturally fit the contours of the user's hand, allowing the fingers to easily and comfortably rest on various buttons when gripping. This design not only improves the user experience, but also effectively reduces hand fatigue and discomfort caused by long-term use of the mouse.

Next, let's discuss the design of the keyboard. As the primary tool for typing and input, the layout of the keyboard directly impacts the efficiency and comfort of the user. A reasonable key layout should follow the natural movement trajectory of the human fingers, allowing users to easily and quickly find the corresponding keys while typing. Additionally, the size and shape of the keys need to be carefully designed to ensure that users can feel the appropriate feedback when pressed, enhancing typing accuracy and comfort. Furthermore, the tilt angle and height of the keyboard also need to be taken into consideration to ensure that the user's wrists can maintain a natural and comfortable posture, reducing fatigue from extended typing sessions.[4] Overall, the size and shape design of mice and keyboards must conform to the principles of ergonomics to ensure that users can maintain a comfortable posture during use. Through refined design, we can provide users with a more natural, efficient, and comfortable user experience, enabling technology to truly serve human life and work.

2.2. Key Feedback Design

Good key feedback is one of the key factors in enhancing the user's operating experience. When users press a key on the mouse or keyboard, a clear and timely feedback can accurately make them perceive the trigger point of the key, thus greatly improving the accuracy and efficiency of the operation. This feedback not only concerns the user's operating experience, but also relates to their comfort and health when using these devices for a long time.

In the design process of mice and keyboards, designers need to pay special attention to factors such as the material, stroke, and force of the keys. The material of the keys should be soft and elastic to ensure a clear tactile feedback when pressed. The design of the stroke needs to ensure that users can feel a distinct actuation point when pressing the keys, instead of being too soft or too stiff. Control of force is also very important, as the appropriate key force can allow users to operate easily while avoiding discomfort caused by excessive or insufficient force.[5]

2.3. Tilt and height design of mouse and keyboard

Apart from the key design, the tilt and height of the mouse and keyboard are also important factors affecting user comfort. A suitable tilt and height can keep the user's wrist and arm in a natural, comfortable position, effectively reducing the fatigue during long-term use. Some high-end mouse and keyboard products already have adjustable tilt and height functions, allowing users to freely adjust according to their usage habits and comfort to achieve the best user experience.^[6]

In the design of mice and keyboards, we need to consider factors such as key feedback, material, travel distance, pressure, tilt, and height in order to provide a clear and comfortable user experience, allowing users to feel more convenience and comfort during use.

3. State of the Art in Human Factors Design for Mouse and Keyboard Products

Currently, ergonomic design products for mice and keyboards in the market have made some progress, mainly reflected in the following aspects:

3.1. Personalized Design

With the rapid development of technology and the improvement of people's quality of life, the demand for computer accessories is increasingly diversifying. Against this backdrop, personalized designs of mice and keyboards are gradually emerging, attracting more and more attention and acclaim from users.^[7]

In order to meet the demand for personalized products from users, designers have begun to delve into the study of user usage habits and preferences. They collected a large amount of information on user behavior, aesthetic concepts, and operational habits through various means such as market research, user interviews, and data analysis. Based on these in-depth studies, designers can more accurately grasp the personalized needs of users and tailor mice and keyboard products to different users according to their personal preferences.

In the field of personalized design, designers focus on considering from multiple dimensions. Firstly, they will design mice of different sizes, shapes, and materials based on factors such as the user's hand shape, finger length, grip habits, etc. This way, users can choose the mouse product that best suits them based on their preferences and comfort. Secondly, in keyboard design, designers also take into account factors such as user typing habits, key frequency, etc., and optimize key layout, adjust key sizes and spacing to allow users to input text more easily and accurately.^[8]

In addition, designers will also personalize the appearance, color, lighting, and other aspects of the product. By using different materials, colors, and lighting effects, designers can create unique, stylish, and personalized mouse and keyboard products. These products not only meet users' practical needs but also bring users more fun and satisfaction during use.

In short, with the diversification of user needs, the personalized design of mice and keyboards has become an irreversible trend. Designers, by conducting in-depth research on users' habits and preferences, tailor mice and keyboard products to meet their individual needs. This not only enhances the user experience but also satisfies users' pursuit of personalized products.

3.2. Intelligent Design

With the development of artificial intelligence technology, mouse and keyboard products are also beginning to move towards intelligent direction. For example, some products can achieve faster and more accurate input by recognizing user gestures and voice commands; and some products can optimize key feedback and layout through adaptive algorithms.

3.3. Environmental Design

Environmental design is no longer a novel concept in today's society, but is deeply ingrained in every aspect of product design. Among them, the mouse and keyboard, as indispensable electronic accessories in our daily work, are particularly notable for their environmental design. With the increasing environmental awareness of consumers and the concept of sustainable development taking root, these seemingly insignificant electronic accessories are also incorporating more environmental considerations into their design.

In the manufacturing process of mice and keyboards, the selection of materials has become especially critical. More and more manufacturers are starting to prefer using recyclable materials to make the casings of their products. Not only does this material reduce the production costs of the products, but more importantly, at the end of the product's lifecycle, these materials can be effectively recycled and reused, greatly reducing the generation of waste and environmental pollution.

In addition to material selection, energy-saving design has also become a highlight in the design of mice and keyboards. By optimizing the internal structure and circuit design of the products, the mice and keyboards consume less energy during operation, not only extending the product's lifespan, but also reducing unnecessary energy waste. This design concept not only meets the requirements of environmental protection, but also meets consumers' pursuit of product performance and user experience.

Therefore, it can be said that environmentally friendly design has become one of the important directions in the design of mice and keyboards. By using recyclable materials and energy-saving design, these electronic components not only provide us with convenient services, but also contribute to the sustainable development of the earth.

4. Future Development Trends

4.1. Pay more attention to user experience.

In today's increasingly competitive market, major manufacturers are focusing on user experience as a core element in order to maintain competitiveness and stand out. User experience not only concerns the functionality and usability of a product, but also involves the overall feelings and satisfaction of users during the usage process. Therefore, as market competition intensifies, manufacturers are paying more attention to understanding and meeting the needs and expectations of users, placing user experience at an important position in product design.

To achieve this goal, manufacturers first comprehensively understand users' usage habits, preferences, and pain points through market research and data analysis. They actively communicate with users, collect feedback and suggestions, ensuring that the product design can accurately meet the needs of users. After collecting enough information, manufacturers will organize professional design teams to conduct detailed analysis and evaluations of the products to identify areas that can be optimized.

In the process of product design, manufacturers pay attention to details and user-friendly design. They focus on every detail when users use the product, from the touch of the buttons, layout of the interface, color matching to the overall usage flow, all strive to achieve the best. At the same time, manufacturers also emphasize the usability and accessibility of the product, ensuring that users can easily get started and quickly grasp the methods of using the product.

In addition to the design of the products themselves, manufacturers also pay attention to providing high-quality after-sales service. They establish a sound customer service system to provide users with timely and professional technical support and solutions. When users

encounter problems, manufacturers can respond quickly and help users solve the issues, ensuring that users have a good experience while using the products.

In short, as market competition intensifies, manufacturers will pay more attention to user experience, continuously optimizing product design to meet users' needs and expectations. They are committed to providing high-quality, user-friendly products, as well as excellent after-sales service, allowing users to experience more convenience and comfort in the process of using the products. This approach not only enhances user satisfaction and loyalty, but also helps manufacturers gain more market share and competitive advantage.

4.2. The level of intelligence continues to improve.

With the continuous development of artificial intelligence technology, the level of intelligence in mouse and keyboard products will continue to improve, providing users with a more convenient and efficient operation experience.

4.3. Environmental protection concept deeply rooted.

The concept of environmental protection, as an important core value of contemporary society, is gradually penetrating into everyone's hearts. With the increasingly severe environmental issues and the growing public awareness of environmental protection, people are paying more attention to the impact of their actions on the environment and seeking ways to practice environmental protection in their daily lives. Against this background, enterprises and manufacturers from various industries are also responding one after another, integrating environmental protection concepts into product design and production processes.

Manufacturers are gradually realizing that environmental protection is not only the fulfillment of social responsibility, but also the key to sustainable development of enterprises. They are paying more attention to the use of environmentally friendly materials, striving to find renewable, biodegradable, environmentally friendly materials to replace traditional, environmentally harmful materials. These environmentally friendly materials not only help reduce environmental pollution, but also can improve the recyclability and reusability of products, thereby reducing resource waste.

At the same time, manufacturers have also started to pay attention to energy-saving designs of their products. By optimizing the product structure, improving production processes, and adopting efficient energy utilization methods, products are able to consume less energy during operation. This energy-saving design not only reduces the product's operating costs but also reduces the burden on the environment, bringing dual economic and social benefits to the company.

Furthermore, manufacturers also convey environmental protection concepts to consumers through promotion and educational activities, guiding them to choose environmentally friendly products and promoting the sustainable development of the entire industry. By showcasing the environmental performance of products, promoting corporate environmental actions, and sharing environmental knowledge, they have increased consumers' awareness and concern for environmental protection, facilitating the popularization and implementation of environmental protection concepts.

In short, the concept of environmental protection will gradually become rooted in people's hearts, and manufacturers will pay more attention to the use of environmentally friendly materials and energy-saving design to promote the sustainable development of the industry. This is not only a manifestation of corporate social responsibility, but also a responsibility and commitment to the earth and future generations.

5. Conclusion

As an indispensable computer accessory in our daily work, the design of mice and keyboards is of paramount importance in ergonomics. This design is not arbitrary, as it relies heavily on the depth support and comprehensive consideration of human factors. Human factor design, as the name suggests, is a methodology centered around human factors, emphasizing the full consideration of physiological, psychological, and behavioral characteristics in the design process to ensure that products can best meet the practical needs of users.

In the human factors design of mice and keyboards, the application of human-centered design is mainly reflected in the in-depth research on the physiological characteristics and operating habits of users. Designers will carefully observe the hand structure, finger length, and gripping habits of users, in order to design mice and keyboards with appropriate sizes and comfortable shapes. At the same time, they will also consider users' psychological needs, such as aesthetic preferences, usage habits, etc., to ensure that the products can also meet users' expectations visually.

With the continuous advancement of technology, the application of human-centered design in mouse and keyboard design is also becoming increasingly prominent. Designers are beginning to utilize advanced design concepts and techniques, such as 3D printing and virtual reality, to create products that are more ergonomically friendly. These new technologies not only make product design more precise and efficient, but also provide users with a richer user experience. Looking ahead, with the continuous changes in the market and the ongoing development of technology, mouse, keyboard, and human-computer interface design products will show more diversity, intelligence, and environmental friendliness. Diversity is mainly reflected in the richness of product types and the satisfaction of personalized needs; intelligence means that products will have more intelligent functions, such as automatic recognition of user habits and automatic adjustment of parameters; and environmental friendliness emphasizes the need to focus on environmental protection and sustainable development in the design process to reduce the impact on the environment.

In general, the development of ergonomic design products such as mice and keyboards cannot do without the support of human factor design. In the future, we have every reason to believe that with the continuous progress of technology and the constant changes in the market, these products will increasingly meet the needs and expectations of users, bringing us more convenient, comfortable, and efficient working experience.

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