Analysis of Principles for Designing Smart and Healthy Living Environments Based on User Experiences and Emotions

Mengyao Feng, Chuteng Shi*, Fankai Meng, Xingyu Liu

Ulster College at Shaanxi University of Science & Technology, Xi'an, Shaanxi, 710021, China

463279276@qq.com, chadwick-teng@outlook.com, Keith_Meng@outlook.com, 576822073@qq.com

Keywords: Smart living environment; User experience; Emotional design; High-quality development

Abstract: With the advancement of science and technology and social changes, people's needs and expectations about the living environment are increasingly improving. They require not only health, comfort, and safety but also intelligence, personality, and emotions. On the design idea of people-centered, we need to propose a design proposition that better meets users' needs for a smart living environment. Based on the dynamic evolution of user experience and emotional design, a theoretical analysis framework for smart living environment design is constructed according to the logic of user needs and emotional experience, which can explain the joint generation of smart living environment design mechanisms and experience cycle mechanisms involving users, technology, and space. Furthermore, we explore the possibility of moving towards the high-quality development of smart living environments from market trends and industrial development. The smart living environment is designed to bring users the desired living experience and is committed to continuously improving the quality of living and enhancing user satisfaction. To this end, we take measures to achieve high-quality development of the smart living environment, promote industrial development, and meet user needs through smart living environment control based on user experience, build an interaction and feedback mechanism between users and quality perception, and establish an evaluation system on users and smart living environment.

1. Introduction

A smart living environment is a concept of a smart home and an element of intelligent life. It can be divided into basic and non-basic smart living environments: smart devices and smart spaces. To improve the user experience and the design, smart home entrusts artificial intelligence to collect and analyze data. Due to technological advancement, user needs have become the key to a smart living environment, and user experience has become an evaluation indicator. Unlike traditional home design, a smart living environment emphasizes personality, humanity, and emotion. Therefore, we put forward the design issues of user experience and emotion. In addition, market trends and industrial development provide an innovative model for a smart living environment.

User experience and emotional design originate from the user-centered design concept. Its design object contains user needs and experience and is also a tool for a smart living environment. From the perspective of design, user experience and emotional design pursue functionality, pleasure, and ease of use, and the designers realize the modernization of a smart living environment by considering users, technology, and space. However, this is only in theory. Today, the smart living environment has implemented a unique user-centric approach. The comprehensive promotion of a smart living environment has changed the home environment and home entities, reflecting the importance of technology and art and changing user behavior and cognition, impacting society and culture. Therefore, discussions about smart living environments must be forward-looking and innovative. From this, we propose a healthy and smart living environment for future development.

In summary, user experience and emotional design are important conditions and guarantees for realizing a healthy and smart living environment. Looking at the current situation, the smart living environment has made progress, but there are also shortcomings. People have yet to fully find an

  DOI: 10.25236/icemudss.2023.026

effective path for artificial intelligence supervision and continue to work hard. Therefore, the basic principle of a smart living environment reflects two-way innovation and shared responsibility, which is beneficial to improving product quality and user satisfaction and is necessary for promoting sociocultural development.

Based on the above background, this paper proposes health and smart living environment design principles based on user experience and emotional design, which aims to explore how to meet the needs and expectations of users for living. Through theoretical analysis and case studies, the problems in the design of smart living environments are solved. The main contents include four parts: new changes in user needs and emotional experience, challenges brought by healthy and smart living environment design, coping strategies of the industry, and future smart living environment design innovation model. This study effectively reduces the risks of technology chaos and artificial intelligence supervision and has theoretical guidance and practical reference.

2. Principles of Designing a Healthy, Smart Living Environment for the User's Experience and Emotions

2.1 New Changes in User Needs and Emotional Experience

User experience and emotional design is a concept developed with smart living environments. It represents the user-centered design concept and highlights the humanistic and emotional orientation of smart living environments [1]. It reflects new changes in user needs and emotional experience. However, when using functionality, enjoyment, and ease of use to determine the definition and nature of user experience and emotional design, a unified and comprehensive answer is difficult to come by [2].

2.2 Market Trends and Industrial Development

Market trends and industrial development are important standards for emerging industries and expressions of industrial innovation level and competitiveness. Domestic and foreign scholars and institutions on market demand, size, market share, and market structure discuss the definition of market trends and industrial development. In addition, some scholars believe that market trends and industrial development represent the industrial life cycle or competitive advantage. Because market trends and industrial developments are, to a certain extent, more forward-looking and strategic, they belong to the science of strategy aimed at strengthening national economic and technological strength. The research history of market trends and industrial development can be traced back to the Industrial Revolution. Its main activities include market research, market analysis, and market forecasting. In addition, market trends and industrial development are closely related to technological revolution and industrial transformation and evolution. By analyzing the market trend, the government, enterprises, and society become the main responsibility of strategic emerging industries. The main contribution of the theory of market trends and industrial development in the new era is to propose an analytical framework and indicators based on new development concepts and high-quality development requirements. Therefore, market trends and industrial development initially focused on quantitative measurements based on attributes such as market size and growth rate [3].

2.3 Innovative Model of Smart Living Environment Design in the Future

Compared with the traditional residential design, the future smart living environment design emphasizes the relationship between user needs and emotional experience and has the characteristics of personalization, humanization, and emotion. Although some scholars have questioned that there may be no direct connection between user needs and emotional experience, most scholars advocate that smart living environment design can influence user satisfaction in the future. Norman et al. proposed a classic definition model of user experience that includes functionality, ease of use, and pleasure. [4]. Since then, the model has become a typical example of living environment design in the future, and the concept of user experience and emotional design has been developed. Scholars believe that user experience and emotional design are subjective. User experience refers to “the inner

feelings of users when using or anticipating using a product in a specific environment." Emotional design can be successful only when user needs are met and emotional experiences are stimulated. Therefore, user satisfaction is the result of future smart living environment design. In addition, scientists summarize the future smart living environment design as a two-way innovation model, namely a supply-side model based on technological innovation and a demand-side innovation model based on user innovation. The former focuses on technology driving, while the latter focuses on user participation. The new design has experienced some failures, but from the perspective of market trends and industrial development, it will improve product quality and competitiveness. In short, in the future, the smart living environment design will gradually become the consensus of research and practice in architecture.

3. Challenges Posed by Healthy and Smart Living Environment Design

3.1 Technical Chaos: The Impact of Over-Automation on System Balance

This part is about the impacts of over-automation on system balance. Over-automation is a problem in applying complex system thinking in smart living environment design [5]. In order to make up for the shortcomings of traditional automation, it has entered the research field as a new model: the technical chaos framework. The basic idea of the framework is as follows. First, excessive automation should ensure that system functions and user needs are realized. Second, set professional standards for a smart living environment. Third, use chaos engineering to capture uncertainty and failures in systems. Fourth, use data analysis and machine learning to measure the stability and reliability of the system. The chaos technology framework restructures the design of smart living environments, improves system flexibility and adaptability, and improves controllability, predictability, resilience, and system continuity.

3.2 Artificial Intelligence Supervision

The challenge of artificial intelligence regulation is the main content of artificial intelligence security governance, reflecting the coordination between artificial intelligence technology and social law and the balance between the risks and benefits of developing and applying artificial intelligence through policies and legal regulations. Some elements of artificial intelligence supervision are gradually taking shape, such as ethical principles, technical standards, laws, and regulations. The evaluation system has also been paid more and more attention. However, from the perspective of international comparison, some practices of artificial intelligence supervision remain in the voluntary and conscientious stage, contrary to the rapid development of artificial intelligence technology and its logical framework and generation mechanism. It has led to regulatory lag, divergence, and uncoordinated problems [6].

4. The Coping Strategies of the Smart Living Environment Industry under the Technological Challenge

4.1 Two-way Innovation: Addressing Technical Challenges

4.1.1 Technological Innovation Improves User Experience

Technological innovation is the basic link between health and smart living environment design, and it is also the core embodiment of user satisfaction. Therefore, the primary task of technological innovation is to meet users' needs and provide emotional experiences. Artificial intelligence is the main driving force of technological innovation and the main body of health and smart living environment design. [7]

Currently, artificial intelligence improves the user experience from the perspective of functionality, ease of use, and pleasure. There are three main ways. The first is intelligent interaction. Artificial intelligence realizes natural, efficient, and friendly information exchange between users and products. The second is establishing standards. Relevant regulators achieve standardized control over user experience by establishing AI quality standards and ethical standards and disclosing privacy standards

to users. The third is the internal process of reengineering artificial intelligence. For example, Dmall used artificial intelligence to enhance the user experience and improve user satisfaction. However, the controllability of artificial intelligence needs to be further improved. The health and smart living environment design pattern based on user experience and emotional design is shown in Figure 1.

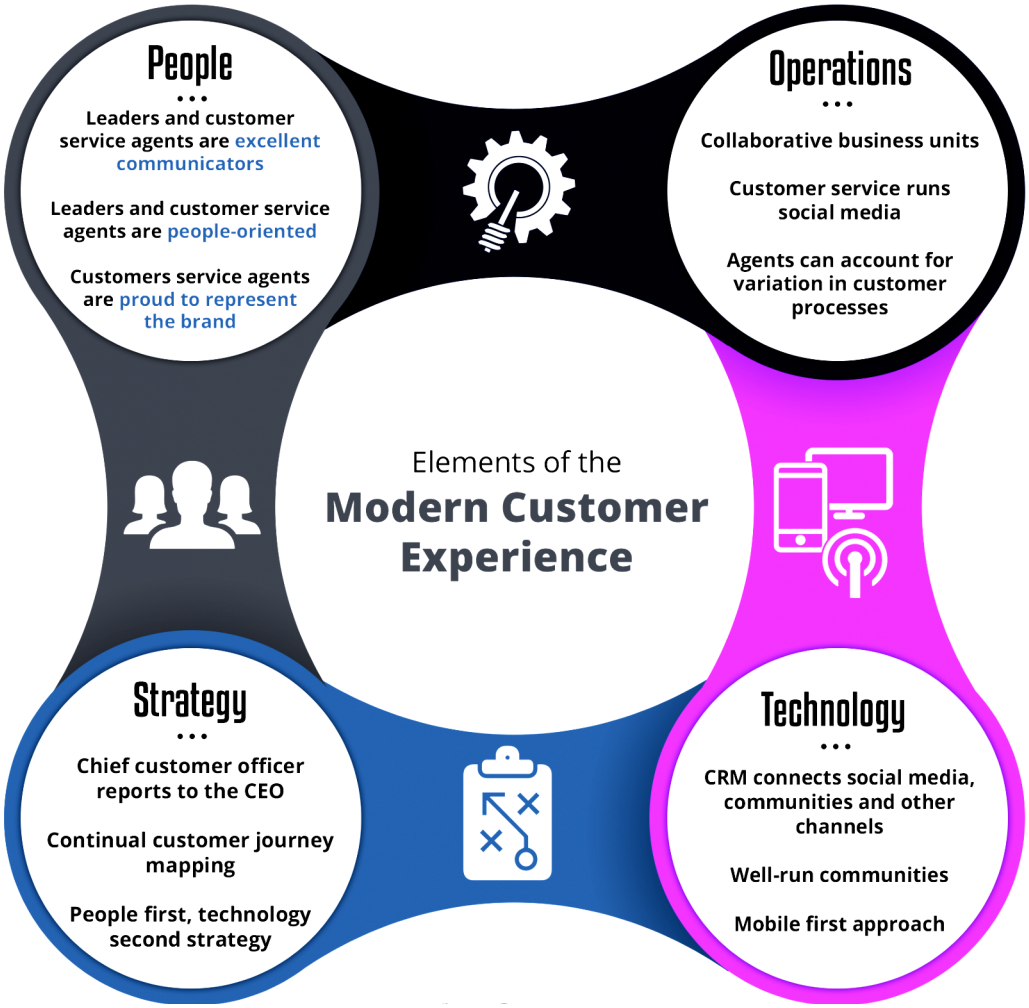

Figure 1 Health and smart living environment design pattern based on user experience and emotional design

4.1.2 Technical Specifications and Review of Smart Living Environment Systems

The fundamental difference between the technical specification and review of the smart living environment system and the traditional architectural design lies in its digital attributes. The system's technical standards and review criteria are aimed at improving the user experience and meeting social needs. The development of a smart living environment mainly reflects functionality and innovation. In the guiding framework of the digital village standard system construction, accurate definition, planning, implementation, and evaluation are the core values and highest standards for developing a smart living environment. Currently, the diversity of smart living environment systems and differences in regional characteristics have led to a diversified trend in living. Although local departments such as Chengdu Housing and Urban-Rural Development Bureau have formulated some technical specifications and review points, the technical standards formulated by the state could be better, and there is also a need for effective regulatory mechanisms. To sum up, there are some problems with the smart living environment, which are detrimental to the quality and safety of the smart living environment.

4.2 Shared Responsibility: Optimizing Regulation and Governance

From the perspective of social governance, the government has restricted the ability of social

participation for a long time. Since the 21st century, social organizations integrating politics, economy, society, and culture have reshaped social governance through diverse and professional networks. However, traditional administrative supervision's shortcomings have restricted social organization development. Because there are still many gaps and imperfections in laws and regulations, as well as the impact of credit and the quality of social organizations, the control of social organizations needs to be improved. In the people-centered ideological theory, social organizations are regarded as a direct way to optimize social governance. However, the actual effect of government-based administrative supervision on social organizations is still controversial. At the same time, human and material difficulties caused the lack of effective self-discipline mechanisms in social organizations. Therefore, social organizations may not always be able to achieve the objective of enhancing public services and advancing public interests. In short, the supervision of social organizations is not only a technical problem but also faces problems connected with responsibility sharing and trust building.

4.3 Prospect of Smart Living Environment Design

Smart living environment design is important in technology chaos and artificial intelligence regulation. In the two-way innovation mechanism, technological innovation is a standard and effective user experience improvement tool, which plays an important role in designing a smart living environment. It also makes designing smart living environments not just a functional concept but also an emotional concept. Therefore, the user-centered design has become a guarantee mechanism for user satisfaction. The practical interpretation of smart living environment design is generally innovative based on the science of human settlements, although this approach contains technical challenges and risks. From Smart Living Environment 1.0 to Smart Living Environment 3.0, its design is closely related to user needs and emotional experience. Smart living environment design is committed to digitalization and intelligence that adapts to market trends and industrial development needs. However, they also bring a dilemma: system imbalance. Overall, there is room for improvement in the design of smart living environments regarding technical specifications, regulatory policies, and social participation. Security and sustainability need to be further improved, which is also an important task of the smart living environment innovation center.

5. Conclusion

Designing healthy and smart living environments is a hot topic, bringing new challenges and requirements to architectural design and social governance. Smart living environment design embodies the symbol of technology chaos and artificial intelligence supervision and is an important means of two-way innovation. Additionally, it meets user experience and emotional design requirements, ensures system balance and sustainability, and reflects the specific requirements of the digital village standard system construction guide. Under people-centered guidance, we build a theoretical analysis framework and practical mechanism for designing a healthy, smart living environment. In recent years, modern information technologies such as the Internet and the Internet of Things have promoted the development of smart living environments. Artificial intelligence empowers user experience, emotional design, and technological chaos's accuracy. Its value fits the internal logic of smart living environment innovation. Therefore, design based on user experience and emotion provides a new approach for smart living environment design. In conclusion, the sustainable development of a healthy, smart living environment will better meet user needs and emotional experiences and promote social governance and industrial development.

References

[1] Sauro J, Lewis J R. Quantifying the user experience: Practical statistics for user research[M]. Morgan Kaufmann, 2016.

[2] Kim S, Ha M. A systematic review of the attributes of interior design affecting user’s positive emotions measured via bio-signals[J]. Journal of the Architectural Institute of Korea, 2020, 36(5): 83-91.

[3] Perera C, Liu C H, Jayawardena S, et al. A survey on internet of things from industrial market perspective[J]. IEEE Access, 2014, 2: 1660-1679.

[4] Norman D, Nielsen J. The definition of user experience (UX)[J]. Nielsen Norman Group Publication, 2016, 1: 2.1.

[5] Parasuraman R, Riley V. Humans and automation: Use, misuse, disuse, abuse[J]. Human factors, 1997, 39(2): 230-253.

[6] Cath C. Governing artificial intelligence: ethical, legal and technical opportunities and challenges[J]. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 2018, 376(2133): 20180080.

[7] Appio F P, Lima M, Paroutis S. Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges[J]. Technological Forecasting and Social Change, 2019, 142: 1-14.