Market demand of smart home under the perspective of smart city

Wennan Geng[1], *Chuanchen* Bi[2*]

[1,2]College of Graduate Study in Management, Khon Kaen University, Thailand

Abstract. China's booming economy and technological advancements have fueled the rapid growth of smart cities. This has led to more connected, efficient urban infrastructure, improving the quality of life and work for residents. Rising consumer standards have sparked interest in comfortable, healthy, safe, convenient, and efficient lifestyles, driving the widespread adoption of smart homes. As people become more accepting of intelligent products, the smart home industry is expected to see growing demand in the future. Therefore, the analysis and research of smart home market demand has important practical significance. On this basis, SWOT analysis analyzes the pros and cons of the smart home product market, PEST method analyzes the macro environment of the market, Porter's Five forces model is used to analyze the micro environment of the market, and understand the status quo and problems of the smart home market. Obtain the demand of smart home market through research and provide development suggestions for enterprises. Keywords: Smart Home; Smart City; Market Demand

1 Introduction

China's technological progress and improving living standards have integrated tech products into daily life. The government prioritizes smart city development, and smart homes align with this vision. However, low awareness and limited popularity pose challenges. This chapter analyzes the smart home market's demands, including connectivity, communication, security, and privacy. This paper explores the future potential of the smart home industry, analyzing market conditions, consumer demands, and product prospects to offer optimization recommendations. The goal is to address current market issues, enhance competitiveness, and promote industry growth.

2. Literature Review

2.1 Development of Smart Cities

Smart cities lead urban development, using advanced tech and networks to collect, analyze, and manage city data via cloud systems. Smart city development is a major global trend, with China's inaugural smart city policy in 2012 titled "Interim Measures for National

* Corresponding author: chuabi@kku.ac.th

Smart City Pilots [1].Wu Jianping mentioned that "smart city" is closely related to "digital city" and "smart city", aiming to digitize human daily activities to the greatest extent[2]. Big data technology has accelerated the construction of smart cities in China, improved service efficiency, and enhanced the convenience of daily life[3]. China's smart city projects are growing rapidly, with more than 800 projects in 2020, mainly distributed in the east. The total number exceeds that of Europe, the United States and India combined. Although there is a gap with developed countries, the future is bright[4].Recent data shows China's new smart city market reached 21.08 trillion yuan in 2021, growing over 30%[5].At present, China has actively carried out the development and construction of smart cities in many cities, and incorporated smart cities into the governance strategy of urban planning.

2.2 Market Demand for Smart Homes

Smart homes integrate IOT technology, connecting household devices to the internet for remote control and automation, streamlining device management[6]. Smart homes use smart technology for device management, security and energy saving, embodying the principles of green and innovative development[7].The global smart home market is expected to reach $121.73 billion by 2022, as reported by M2 Presswire journal[8].The global smart home market is thriving, highlighted by Google's 2022 launch of Matter 1.0, a platform promoting device and ecosystem compatibility[9].Jamie Moss, the Research Director of IOT Hardware and Devices at ABI Research, stated, "The growth of the Internet of Things is inevitable[10].With the advancement of wireless communication technology, smart homes are becoming increasingly important in energy management, performance optimization and consumption reduction[11].National policies now favor widespread adoption of smart homes, driven by AI, big data, and cloud computing for personalized, proactive services to diverse users[12].User demand for smart homes is continuously increasing, evolving rapidly from initial remote app control to emotional interaction[13] .Due to various factors, the overall penetration rate of smart homes in China is still low[6].

3. Research Methods

Conduct consumer surveys to measure smart home product demand and satisfaction, filter and analyze data to uncover market issues and causes. The survey response rate was 92.8%, providing a comprehensive understanding of the smart home market. SWOT evaluates internal and external factors, PEST analyzes the macro environment, and Porter's "Five Forces" model examines industry competition.

4. Research Findings

4.1 Analysis of Questionnaire Survey Data

The basic information section of the survey includes gender, age, educational background, and monthly income of the respondents. The survey shown in Figure 1 showed a higher percentage of male respondents, suggesting that men are more interested in smart home products. Young and higher-income groups are more interested in smart home products.

	Study population	Percentage
Gender	Man	52.31 %
	Woman	47.69 %
Age	Under 18 years of age	9.23 %
	19-29 years old	64.62 %
	29-40 years old	15.38 %
	40-49 years old	4.62 %
	Over 50 years old	6.15 %
Educational background	High school and below	18.46 %
	College	20 %
	Undergraduate	49.23 %
	Graduate degree or above	12.31 %
Monthly income	Below 3000 RMB	20 %
	3000-5000 RMB	23.08 %
	5000- 8000 RMB	27.69 %
	8000-15000 RMB	18.46 %
	More than 15000 RMB	10.77 %

Figure 1 : Basic information of the interviewee.

The level of understanding of smart home is shown in Figure 2. Thus, it can be seen that the majority of respondents have some level of awareness about smart home.

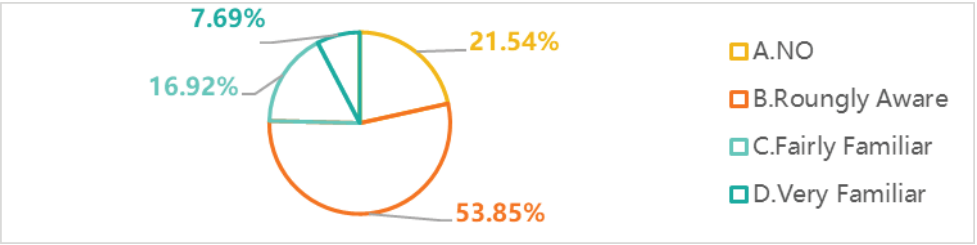

Figure 2: Understanding of Smart Homes.

As shown in Figure 3. The respondents were most concerned about the product quality, price and appearance. It is clear that product quality is a core issue of consumer concern, because ensuring product quality is essential to gaining consumer favor. Similarly, product price is an important consideration for consumers, as it directly affects their purchasing behavior[14].

Figure 3: Buying the product cares about the most.

As shown in Figure 4. Network problems and operational problems are the most important problems when users use them. The second is the security and privacy issues and product quality issues. Improving network connectivity, ensuring stability, and simplifying user operations are key focus areas in the smart home industry's development[15].

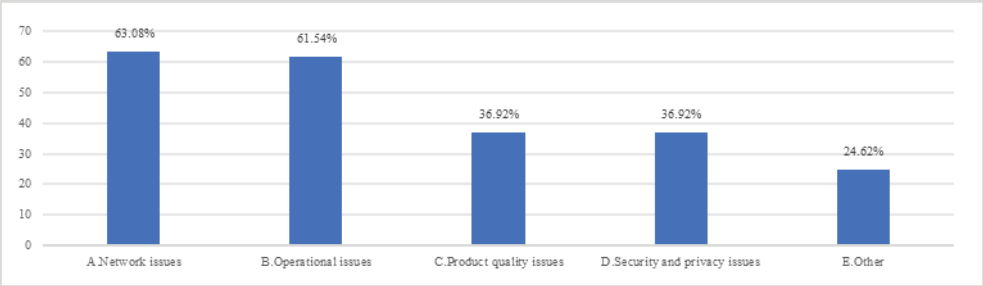

Figure 4: Problems encountered in use.

4.2 SWOT Analysis of the Smart Home Market

SWOT is used to analyze the internal and external factors of smart home, summarize the existing problems and development trends in the smart home market respectively, and put forward theoretical guidance for the development of smart home. See Figure 5 for details.

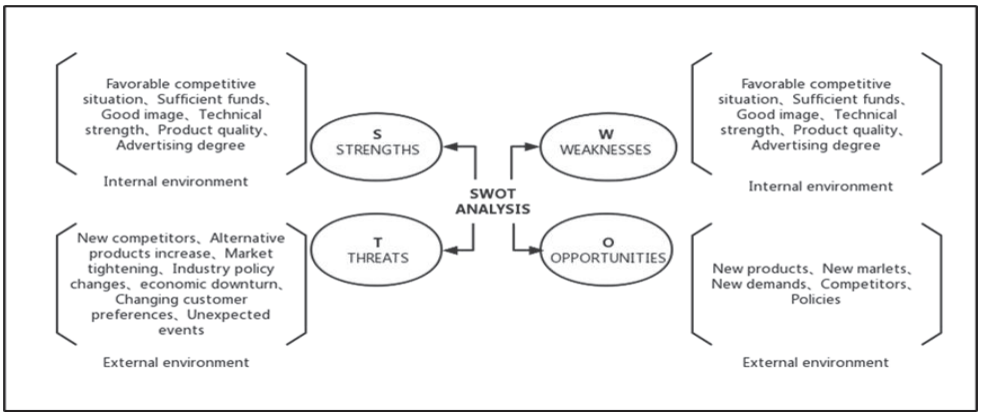

Figure 5: SWOT Matrix analysis diagram.

Smart home research and development needs to give priority to personalized functions and needs, increase user awareness and acceptance through effective promotion and experience, and make full use of advantages and opportunities[16]. At the same time, by monitoring the health and safety of vulnerable groups and providing convenience, the need for a wide range of social services is reduced[17].Shortcomings in smart home control and personalization require more research and innovation to better meet diverse user needs.

Through the Analysis of Strengths and Threats. Pay attention to and address issues of product interoperability and incompatibility, standardizing the smart home industry's norms and standards[18]. Address smart home manufacturers' proprietary ecosystems and product incompatibilities through standardization, improved communication and enhanced user experience, reducing costs and promoting smart home product adoption[19].

Through the Analysis of Weaknesses and Opportunities. The purchase of smart home products entails the collection and online storage of users' personal information via AI, IOT, and data collection technologies[20] .In the smart home industry, ensuring network security, user privacy, and addressing IOT security vulnerabilities is crucial[21]. Privacy loopholes exist, and the absence of unified communication protocols and standards necessitates the establishment of industry-related standards for advancement.

Through the Analysis of Weaknesses and Threats. Thorough analysis, customer understanding, product segmentation, and emphasis on user interaction can meet personalized needs in the smart home industry, ensuring practicality and user-friendliness while avoiding "pseudo-intelligence" products and enhancing the design and innovation of future smart home products.

4.3 PEST Analysis of the Smart Home Market

Political Environment Analysis. Emphasizing guiding the interconnection of smart home products, and enriching the digitalization of "one-key control" and "one-stop response" home life applications[22] .It is suggested to continue to expand the supply of smart devices, smart home, health monitoring, pension and other smart terminal products suitable for aging[23].Emphasize the full use of new technologies to improve the relevance of big data platforms and residents' lives[24].The focus is on the upgrading of new information products such as intelligent, high-end, integrated information products and digital home products[25]. The country is committed to improving enterprise technology, promoting innovation, and providing high-value professional products and services to improve residents' quality of life.

Economic Environment Analysis. By 2023, the impact of the influenza pandemic on China's economic growth is expected to weaken significantly. As the economic situation recovers, China's GDP is expected to reach $19.5 trillion by 2023

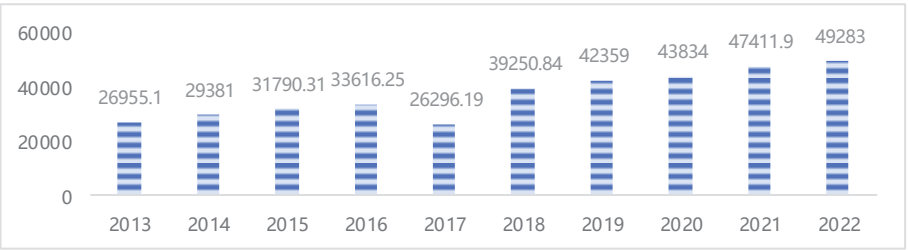

Figure 6: Personal disposable income of Chinese residents in recent ten years.

As shown in Figures 6 [26] and Figures 7 [27] as residents' income increases, their purchasing power and pursuit of a high-quality lifestyle will continue to deepen along with the development of society and the economy.

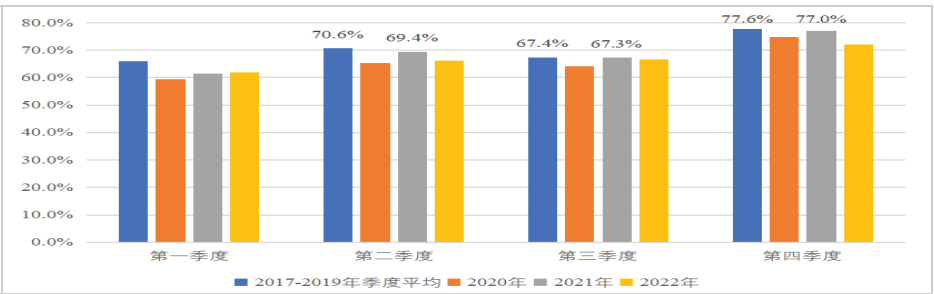

Figure 7: China's household consumption rate by quarter, 2017-2000.

Social Environment Analysis. Smart homes are based on Internet technology, and technological advances such as 5G, IOT and artificial intelligence have also promoted the

development of the industry[28]. An increasing number of smart home products are entering the market and becoming part of residents' daily lives[29].

4.4 Porter's Five Forces Analysis of the Smart Home Market

With the continuous development of the smart home industry, consumer attention and demand for smart home products are increasing, leading to numerous companies entering the smart home market [30].

Analysis of Existing Competitors. Google and Apple are leveraging their strengths to position their strategies in the smart home market by acquiring robotics and artificial intelligence companies. China's rapid economic growth and growing demand have made it an important consumer market, attracting foreign smart home manufacturers.

Threat of Substitutes Analysis. The smart home market faces competition from traditional devices and higher costs due to advanced technologies, requiring supporting control platforms. Xiaomi's ecosystem partnership and Huawei's core technology approach differentiate them in meeting consumer demands.

Analysis of Potential New Entrants. Technological advancements and market demand growth may attract new competitors, including internet companies, intensifying competition in the smart home industry as they establish platforms and offer products[31]. Companies like Baidu, JD.com, Midea, Huawei, and Gree have entered the smart home market through various strategies.

Analysis of Supplier Bargaining Power. With the advent of the big data era, there is a lack of Internet talent. Many companies resort to outsourcing for the development of certain projects[32] . Outsourcing has led to an increase in labor costs for enterprises, and wages and benefits need to be increased to attract talents. At the same time, the expanded parts supplier base provides more choices, and large-scale manufacturers can independently produce parts, reducing the bargaining power of suppliers.

Analysis of Buyer Bargaining Power. Consumers hold bargaining power in the smart home market due to the similarity of product functionalities and their price-consciousness, especially considering the generally higher pricing of smart home products compared to traditional alternatives.

5. Conclusion and Recommendations

5.1 Recommendations for the Smart Home Industry

Establish Unified Industry Standards and Collaborate with Ecosystem Partners. Accelerate the research of smart home product standards, improve quality, enhance experience, and ensure the ecological symbiosis of collaborative enterprises. Companies should strengthen communication with ecosystem partners and develop strategic plans that meet market needs[33].

Research and development innovation in technology. The smart home should prioritize intelligence, high quality, and practicality, as many solutions currently remain conceptual, resulting in an inferior user experience[34]. We need to improve research and development capabilities, especially core hardware, and invest more resources in core technology development.

Core technologies empowered by the Internet. In the vast marketplace, only by possessing core technologies can companies stand at the forefront of industry development and lead the way[35].

Increase efforts in promoting widespread adoption. Users tend to collect information extensively and make segmented decisions, and companies need to strengthen marketing and improve the dissemination of smart home concepts and knowledge[36].
Product market segmentation. Companies should adjust marketing strategies based on the characteristics of the target market, taking into account consumer age, income and preferences[37]. Market segmentation can attract a larger consumer base and help companies establish a stronger and more stable market presence.

Customer service and after-sales support. Poor smart home after-sales service increases maintenance costs and reduces satisfaction. It is necessary to improve the quality and service standards of after-sales personnel and provide professional training to improve service capabilities[38]. Expand offline repair centers to provide door-to-door pick-up and efficient online repair services to increase convenience and provide a seamless and timely repair experience.

Security and privacy protection. With the increasing amount of data generated by smart home devices, security and privacy protection have become critically important[39]Smart home products utilize IOT, artificial intelligence and data, and there are risks of data leakage and abuse, and technology and quality still need to be improved[40]. Companies should establish agreements with trusted cloud data platforms to protect users' personal information and regularly upgrade their systems to prevent information leakage vulnerabilities.

User experience and usability. To enhance the smart home user experience, companies should simplify product operations, improve compatibility among different products, and establish offline experience stores to boost user acceptance and drive industry development.

5.2 Discussion

The development of smart homes improves convenience, safety and quality of life, while promoting sustainable urban development through energy conservation. However, internet connectivity raises privacy and security concerns, and data protection is paramount. The smart home market has diverse standards and protocols, and unified standards will help accelerate industry growth. Company cooperation is crucial in terms of product and service quality to meet different consumer needs. Smart homes will be smarter and more automated, using artificial intelligence and machine learning to solve health, healthcare and aging issues. Technological advancements provide convenience and benefits, but users need to prioritize security, privacy, and systems that understand personal information and home security.

5.3 Conclusion

The development of smart homes has brought new services, redefined customer experiences, and stimulated market demand. With the continuous development and construction of smart cities and advancements in IOT technology, cloud computing, and other advanced technologies, smart homes have vast market value, and the market prospects for smart homes are promising. The smart home industry, as a sunrise industry, meets the growing needs of people with its convenience and other features. It is an inevitable choice for people's home life consumption concept upgrade. We should have high expectations for the development of the smart home industry and anticipate that

advancements in artificial intelligence technology will bring new changes to the industry. While seizing the opportunities, we should also effectively respond to various challenges.

References

1. C. G. M. o H. a U.-R. Development, “Interim Measures for the Administration of National Smart City Pilots.” 2012. Online.. Available: https://www.gov.cn/zwgk/2012-12/05/content_2282674.htm
2. J. Wu, “Core Concept of and Essential Approaches to Smart City Construction,” *national*, vol. governance(24, pp. 48–51, 2022, doi: 10.16619/j.cnki.cn10-1264/d.2022.24.011.
3. W. Liang, “On smart city and urban and rural planning in the era of big data,” *Urban Construction Theory Research (electronic*, vol. version)(19, pp. 13–15, 2023, doi: 10.19569/j.cnki.cn119313/tu.202319005.
4. W. Wu and H. Chen, “Research Review on Smart City Construction in China,” *Journal of Yan ’an University (Social Science Edition*, vol. 44, no. 06, pp. 62–67, 2022.
5. Z. Bai, Z. Dong, C. Deng, and D. Gao, “Research and thinking on the development of new smart cities under the overall layout of Digital China construction,” *Communication*, vol. world(13, pp. 25–27, 2023, doi: 10.13571/j.cnki.cww.2023.13.012.
6. J. Peng, “Smart home industry investment prospect analysis. National circulation economy.” 2020. doi: 10.16834/j.cnki.issn1009-5292.2020.01.059.
7. S. Wang, “Research on the marketing strategy of Xiaomi’s smart.” 2021.
8. “Smart Home Market worth 121.73 Billion USD by 2022.” 2016.
9. C. c network, “Omdia Smart Home Market Key Trends Observation.” 2022. Online.. Available: http://www.iotworld.com.cn/html/News/202208/a7c7a87c55205c12.shtml
10. Qianjia, “AI and ML drive the growth of connected devices.” 2023. Online.. Available: http://www.iotworld.com.cn/html/News/202307/d4cab72ef26527b3.shtml
11. F. AlFaris, A. Juaidi, and F. Manzano-Agugliaro, “Intelligent homes’ technologies to optimize the energy performance for the net zero energy home,” *Energy & Buildings*, vol. 153, 2017.
12. H. Yan, C. Lin, Y. Liang, and H. Chen, “Understand the smart home market,” *Communication enterprise*, vol. management(01, pp. 60–62, 2021.
13. L. Jiao, Y. Hu, M. Wang, X. Zhao, Z. Zhang, and J. Lin, “Research on evaluation technology and standard of ntelligent.” 2022.
14. M. Wang, “Quality management in the Internet of Everything era,” *Shanghai*, vol. quality(01, pp. 26–28, 2020.
15. Q. Deng, “Efficient and stable connectivity is the foundation of a comfortable smart home,” *Modern household*, vol. appliance(11, pp. 27–28, 2022.
16. Q. Wu, J. Zhao, H. Zou, and P. Chen, “Design and implementation of smart home elderly care system,” *Internet of things technology*, vol. 13, no. 09, pp. 111–113, 2023, doi: 10.16667/j.issn.2095-1302.2023.09.029.
17. M. Guo and X. Tan, “Smart home compensation and deprivation of the rights of the digital vulnerable groups,” *Media forum*, vol. 6, no. 01, pp. 34–40, 2023.
18. T. Chen, J. Lin, C. Dong, Y. Liu, and S. Huang, “Construction and application of smart home technology standard system,” in *China Standardization Conference (2022*, Nanjing, Jiangsu, China, 2022.
19. X. Gu *et al.*, “Analysis on Status Quo of Smart Home Standards Development.” China Standardization(17, pp. 88–92, 2023.
20. T. Zhu and F. Dong, “Research on application problems and trends of artificial intelligence in home service industry,” *Journal of Zhongzhou University*, vol. 37, no. 01, pp. 22–26, 2020, doi: 10.13783/j.cnki.cn41-1275/g4.2020.01.005.
21. N. Peng, G. Lin, H. Lin, B. Li, W. Liu, and S. Liang, “Research on network security issues in smart home systems,” *Electrical*, vol. age(07, pp. 84–89, 2023.
22. S. C. o China, “Guiding Opinions on Accelerating the Development of Digital Homes and Improving Living Quality.” 2021. Online.. Available: https://www.gov.cn/zhengce/zhengceku/2021-04/17/content_5600311.htm

23. M. Xiaowei, “Report on progress made in strengthening and advancing work on ageing.” 2022. Online.. Available: http://www.npc.gov.cn/c2/c30834/202208/t20220831_319086.html
24. M. o N. R. o China, “Technology outline for the construction of space-time big data platform for smart city.” 2019. Online.. Available: http://gi.mnr.gov.cn/201902/t20190218_2395831.html
25. S. C. o China, “Guiding Opinions on Further expanding and upgrading information consumption to continuously Release the potential of domestic demand.” 2017. Online.. Available: https://www.gov.cn/zhengce/content/2017-08/24/content_5220091.htm
26. T. C. N. B. O. S. O. CHINA, “China - Disposable personal income.” 2023. Online.. Available: https://zh.tradingeconomics.com/china/disposable-personal-income
27. E. R. T. t e s a group, “China’s Economic Review in 2022 and Economic Outlook in.” 2023. Online.. Available: http://ie.cass.cn/academics/economic_trends/202301/t20230128_5584374.html
28. S. Chen, L. Fu, J. Xu, and X. Huang, “5G key technologies and their impact on iot,” *Digital communication*, vol. world(12, pp. 142–144, 2021.
29. C. Song and H. Gao, “Design of smart home experimental training platform based on ‘artificial intelligence + Internet of Things,’” *Science & Technology*, no. ion(09), pp. 33–35, 2022, doi: 10.19694/j.cnki.issn2095-2457.2022.09.08.
30. Z. Yang, “The Internet of Things has entered the era of bulls.” p. 030, Jun. 13, 2011.
31. H. Tang and J. Zhao, “Research on the development path of smart home enterprises under the background of cross-border e-commerce – Taking Wuxi Fussi Gate Control Company as an example,” *Modern*, vol. Business(15, pp. 51–52, 2020, doi: 10.14097/j.cnki.5392/2020.15.024.
32. W. Che, “Discussion on the application of big data and Internet of Things technology in smart cities,” *Smart*, no. ina(Z1), pp. 108–110, 2023.
33. L. Li, “Construction of Smart System fome the Perspective of Ecological Civilization,” *China Forest Products Industry*, vol. 58, no. 11, pp. 97–99, 2021, doi: 10.19531/j.issn1001-5299.202111020.
34. S. Yin, “Innovation based on customer value under the background of ‘New Retail’ Enterprise competitive strategy choice.” Shanghai Business(05, pp. 18–20, 2021.
35. L. Zhang and Y. Cao, “The development prospect of smart home market in the context of Internet of Things-An analysis based on consumer behavior survey,” *National circulation*, no. my(07), pp. 6–8, 2021, doi: 10.16834/j.cnki.issn1009-5292.2021.07.002.
36. S. Li and W. Qu, “Research on consumers’ resistance to product innovation in smart home field,” *Modern marketing (next*, no. ue)(03), pp. 68–70, 2022, doi: 10.19932/j.cnki.22-1256/F.2022.03.068.
37. L. Xie and K. Mao, “Ningbo Middle way smart home system marketing strategy research,” *Rural economy and technology*, vol. 30, no. 22, pp. 128–129, 2019.
38. W. Zhang, “Research on Online and Offline Channel Integration of YS Smart Home Products.” Master). Zhejiang Gongshang University, 2020.
39. S. Peng, “Explore the practical application of Internet of Things in intelligent life,” *Digital Technology &Application*, vol. 39, no. 12, pp. 59–61, 2021, doi: 10.19695/j.cnki.cn12-1369.2021.12.19.
40. L. Lan and L. Chen, “Design of smart home security system based on Internet of Things,” *Digital Technology &Application*, vol. 40, no. 01, pp. 177–179, 2022, doi: 10.19695/j.cnki.cn12-1369.2022.01.57.