

Development Trend of Smart Home Industry A case study of Haier Smart Home

Yiru Pan^{1, a, *, †}, Yuehan Wu^{2, b, *, †}, Yuanwu Xin^{3, c, *, †}

¹School of Economics, Xiamen University, 361005, Xiamen, China

²Finance, Zhejianggongshang University, 310000, Hangzhou, China

³Business School, University of Shanghai for Science and Technology, 200093, Shanghai, China

*Corresponding authors: ^a15220182202600@stu.xmu.edu.cn; ^b1806070223@pop.zjgsu.edu.cn; ^c13810327375@163.com

†These authors contributed equally.

Abstract. In recent years Smart Home appliance is a research hotspot in the home appliance industry. It is the product of a series of high-end technologies such as the Internet of Things, 5G, and AI, and is in the growth stage of the product life cycle. In this paper, the PESTAL analysis method and Porter's Five Forces model are used to analyze the environment and competition in the Chinese smart home industry. It is found that the generation of Smart Home conforms to the upgrading of social demand and economic development, so it is supported by the government. However the industry now lacks a unified technology connector, resulting in the fragmentation and isolation of current products from different producers. This paper also takes Haier Smart Home as an example, focusing on its analysis of product logic chain and of financial status. Through the establishment of seven brands, Haier Smart Home has created a perfect product system, which can meet the multi-level demand of middle and high-end, and ranks high in sales. Contrast to its competitors, Haier Smart Home's complex ownership structure and overlapping sales channels do harm to the efficiency of its operation, which eventually result in a low-profit margin, but its sales are high, and asset turnover also maintains at a good level, so the company overall operation is in good condition, and its future growth space is large.

Keywords: Smart home appliance; PESTAL; Porter's five forces; Financial analysis.

1. Introduction

With the progress of modern science and technology and the popularity of the Internet, intelligent products have begun to enter the society and the family, intelligent home through intelligent networks combined with a series of sensors and linkage devices, realize the intelligent family, to people's life has brought great convenience. With the development of The Times and intelligent technology, in the home appliance industry, intelligence is also the inevitable trend of its development, and this trend has begun to emerge [1]. With the increasing interest of consumers in intelligent home appliances, more and more intelligent home appliances will enter the consumer market. People can control all home appliances through integrated devices, not affected by space and time. At the same time, also puts forward higher requirements for home appliance enterprises. The market needs more stable performance and lower price, and needs to combine with different groups to launch products suitable for their consumption. Only by complying with the trend of The Times can household appliance companies continue to develop. Otherwise, they can only be annihilated by the flood of history [2].

In the current era, based on the broad market space, 5G, LOT, AI, and other rapid iterations of technology, the policy dividend of new infrastructure, and the demand of new consumption situation, the development of the smart home industry has accelerated significantly [4]. Domestic giants flock to this race track. Haier Smart Home has successively established Three-winged bird experience stores in Beijing, Qingdao, and other areas. Mainly provide balcony, kitchen, bathroom, whole house air, whole house water, audio-visual and other scenarios of ecological solutions. In addition, Haier Smart Home has created the industry's only Home OS 3.0 operating system for Smart Home scene ecology, reflecting Haier Smart Home's absolute advantage in Smart Home AIOT technology [7].

In recent years, the competition in the smart home industry is becoming increasingly fierce. Financial analysis plays an increasingly important role in enterprise management. A correct understanding and analysis of financial information can help enterprises make more accurate decisions and further put forward suggestions for improvement [9].

With the arrival of COVID-19, the demand for home appliances is shrinking, residents' purchasing power for home appliances is declining, and market competition in the home appliance industry is increasing. In the face of the epidemic, Haier Smart Home has achieved remarkable results from three aspects: enterprise innovation, channel transformation, and cross-platform interconnection. [1] Haier Smart Home keeps up with the development of The Times and operates through multiple channels. While doing well in offline sales, Haier Smart Home competes and cooperates with other household appliance brands to expand the online domain and ensure the depth and breadth of the brand. [10] Therefore, we pay attention to the transformation and upgrading of Haier Smart Home and provide some reference for the development and operation of more existing Smart Home appliance manufacturers.

This paper first introduces the development history of Haier Smart Home and analyzes its main businesses, products, and brand strategy. Next, PESTAL and Porter's Five Forces Model are used to analyze the enterprise's basic competition status and overall external competitive environment. In the fifth part, the financial indicators of the enterprise are analyzed, and in the sixth part, research conclusions and suggestions for the future development of the Haier Smart Home appliance industry are put forward.

2. The basic information of the company

2.1 Company History & Recent Developments

Haier Smart Home is renamed by Qingdao Haier, founded in 1984, went public in 1993. Its main business is the production, research, development, and sales of all kinds of white appliances, and its controlling shareholder is Haier Group. Haier Smart Home has grown into a leading enterprise of white home appliances in 27 years. Through the integration of domestic growth and overseas mergers and acquisitions, Haier Smart Home in China and the overseas market established a complete production and sales network, the globalization of successful product expansion. For 11 consecutive years, according to Euro monitor, Haier Smart Home ranks first, the share of the world electrical appliances in 2020, Haier Smart Home in the world market share of 16.5%.

At the beginning of brand establishment, Haier Smart Home developed the refrigerator and washing machine business strongly, integrated the white goods industry, and rapidly expanded its market share. Subsequently, Haier Smart Home chose the development path of overseas brand creation and high-end brand creation, innovated to establish a global brand strategy, carried out large-scale acquisitions, and committed to realizing the long-term layout of the brand. This also allows Haier Smart Home to maintain a steady increase in revenue against the backdrop of the current global COVID-19 outbreak.

2.2 Haier Smart Home's main products

At present, Haier Smart Home has seven global brands: Haier, Casarte, and Leader, covering the Chinese market, and GEA, Fisher Paykel, Aqua, and Candy, covering the overseas market. Haier Smart Home's global operation support system improves the global market share and profit rate. This has given it a leading brand position in overseas markets and high-end sectors, and it has been included in the Fortune Global 500 several times.

Haier's brand strategy not only aims to expand the geographical coverage of the company's business but also enriches product categories and brand positioning. Haier's sub-brands have clear positioning, complete category coverage, and a high integration rate.

Table 1. Haier series of products and brand layout

audiences	Young audience	Fashionable white-collar	Urban elite		Luxury groups		the nobility
	leader	Haier	Candy	Aqua	GEA	Casarte	FPA
Air conditioning	✓	✓	/	/	/	✓	For overseas
Refrigerator	✓	✓	For overseas	For overseas	✓	✓	For overseas
Washing Machine	✓	✓	For overseas	/	/	✓	For overseas
Water heater	✓	✓	/	/	/	✓	/
Television	✓	✓	/	/	/	✓	/
kitchen appliances	✓	✓	For overseas	/	✓	✓	For overseas
freezer/wine cabinet	✓	✓	For overseas	For overseas	✓	✓	For overseas
coffee maker/dish washer	/	✓	For overseas	For overseas	✓	/	For overseas
vacuum cleaner	/	✓	For overseas	For overseas	/	✓	/
brand positioning	sub-brands	mass-market brand			High-end brand		Super high-end brand

In terms of product positioning, it can be seen from the figure above that Leader covers young masses, Haier covers young fashionable white-collar workers, Candy and Aqua target urban elites and are exclusively for overseas, Hong Kong, and Taiwan regions. GEA is positioned at the peak of the urban layer, WHILE FPA is based on the star aristocrat, while Casarte is steadily marching towards noble luxury. The seven brands cover all levels of consumer groups, precise positioning, "each plays its role."

Haier Smart Home relying on research and development, manufacture, and marketing localization of layout, has become the mainstream in the market mainstream brands, is to serve the world's 1 billion households. The advantages of high-end brand formation also provide basic advantages for Haier Smart Home to transform track-to-scene brand and ecological brand. In recent years, the company is committed to digital transformation, promoting the development strategy of reducing cost and improving efficiency. In order to achieve high-quality market share growth, Haier Smart Home will focus on the reform of product innovation and scene reconstruction, while promoting digital reconstruction to realize the value-added of the whole process.

2.3 Haier Smart Home's main business

Haier Smart Home's main business mainly includes Chinese smart home business, overseas smart home business and accessories, small household appliances, channel distribution, and so on.

One of the innovative proposed clothing networks, air network, water network of the whole house solutions.

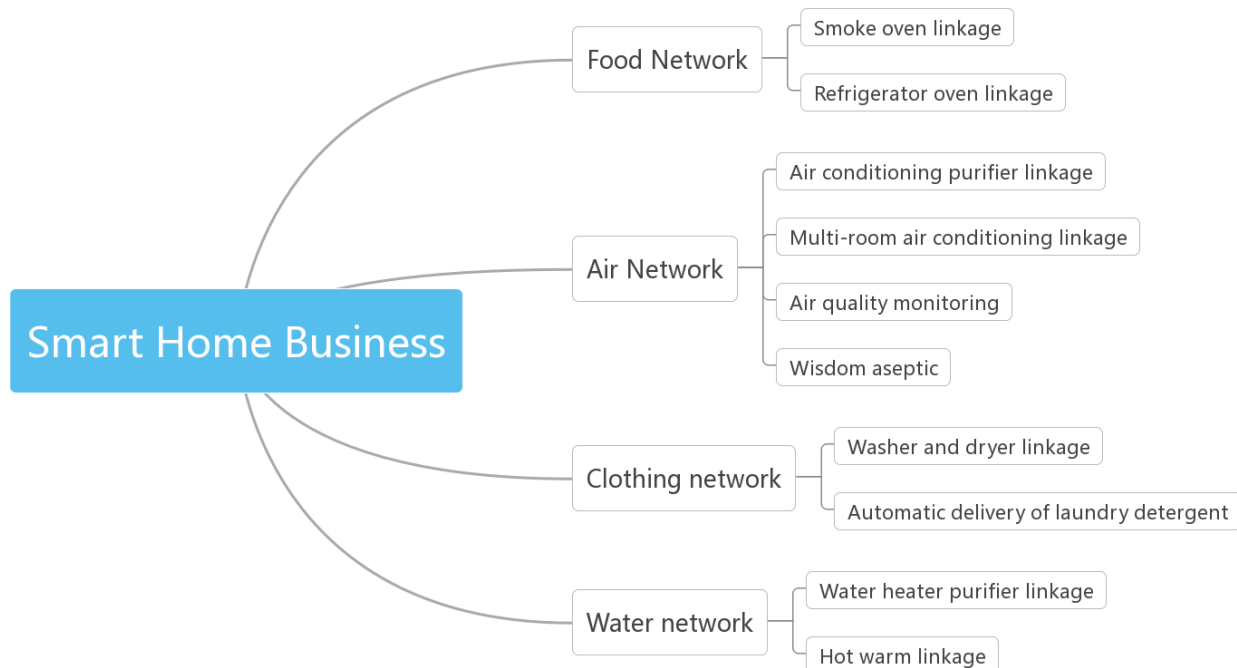


Figure 1. Haier Smart Home smart home business

Each network includes several products show in the picture. Food network includes smart solutions for smoke oven linkage and refrigerator oven linkage; Air Network mainly solves the smart business such as family adaptation ventilation and air purification; Clothing network is responsible for intelligent laundry such as Washer and dryer linkage Automatic delivery of laundry detergent; Water network includes Water heater purifier linkage and Hot warm linkage.

3. China smart home industry environment analysis

The smart home industry aims at proving resolutions to satisfy the needs of various living scenes of human beings by controlling single or multiple household appliances.

3.1 Policy support

China's manufacturing industry is transforming and upgrading from "made in China" to "created in China". The government is encouraging product innovation with high profit and high-tech content. The smart home industry is a high-tech industry that combines 5G communication technology, the Internet of things, and artificial intelligence algorithms, which have attracted the attention of the government. In 2016, "smart home" was written into the government work report; In 2017, "smart home" upgraded to one of the six key areas of demonstration projects. Under the guidance of the central government, governments in different provinces have introduced various supporting policies to smart home enterprises with preferential loan interest rates and tax reductions.

3.2 Technology innovation

Smart home technology mainly involves three intelligent modules: perception, judgment, and response. With policy support, smart home patent technologies have increased substantially, showing explosive growth in 2015, with at least 3,000 patents applied for smart home technologies every year.

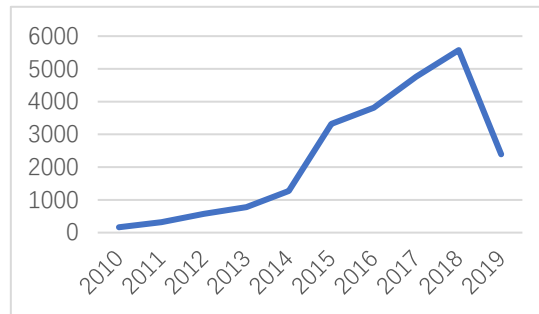


Figure 2. Number of new patent applications of Smart home appliances

Innovation is concentrated in a few strong, established home appliance companies, such as Xiaomi and Gree. Such enterprises have abundant funds, which can attract talents and bear high research and development costs.

3.3 Growth of social demand

With the growth of China's economy, people have put forward higher requirements for the comfort, convenience, and safety of housing. Smart home technology can achieve diversified scene goals, improving the quality of life and alleviating social contradictions.

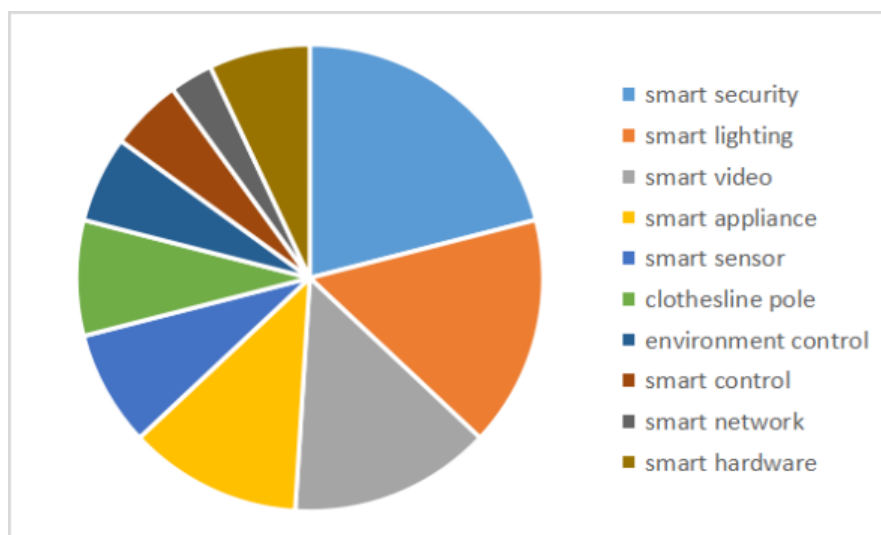


Figure 3. Number of new patent applications of Smart home appliances

Smart home appliances can solve some rigid needs. At present, the serious problem of the aging population in China and the introduction of the three-child policy increases the demanded caring for the elders and children. For example, smart monitors allow people to keep track of what's going on at home while they are absent.

Additionally, the smart home appliance can solve some improvement needs. The high pressure of work makes many young people pay more and more attention to a healthy lifestyle. For example, the smart kitchen can provide food inventory management, cooking time and seasoning control, and other technologies to help people cultivate healthy eating habits; smart bedrooms can provide sleep time management techniques to help people foster good sleep habits.

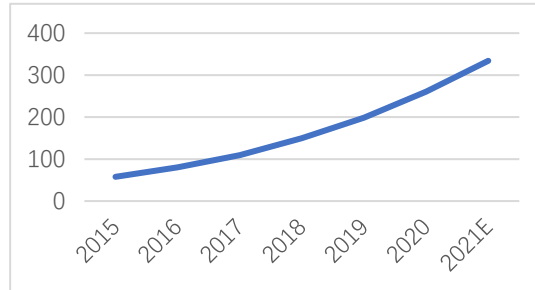


Figure 4. Smart home appliance output in China (million units)

3.4 Absence of industry norms

To protect their technology patents, different enterprises are unwilling to share connection platforms and often use different product connection ports. Therefore, a large number of products on the current smart home market are incompatible with each other. When consumers consume products from different manufacturers, they need to download multiple APPs for separate management, which not only leads to the inability of multiple brands of electrical appliances to work together but also makes different manufacturers need to develop operation platforms repeatedly, resulting in waste of investment.

3.5 Upgrading of environmental technology

On the one hand, the upgrading of environmental protection technology has reduced the environmental pollution caused by home appliances. As we know, home appliances will cause all kinds of pollution to the environment in the process of manufacturing, using, and discarding. However, the development of a series of environmental protection technologies has gradually reduced the pollution that electrical appliances may cause such as degradable plastic production technology and waste household appliances recycling technology.

On the other hand, the smart home industry can also contribute to environmental protection. The smart circulation system can detect and reduce indoor PM2.5 and formaldehyde content; Smart stoves can reduce the smoke produced during cooking.

3.6 The economic development

In the first half of 2020, due to the impact of the COVID-19, the retail sales of the Chinese home appliance market dropped 2.73%. Under the influence of the rural home appliance policy in the past few years, the traditional home appliance industry has been close to saturation. In addition, the slowdown of the real estate market also harms the home appliance market.

In the first half of 2020, 70% of smart home products were sold through e-commerce platforms. The smart home category, smart lighting, home security, smart home appliances, smart audio, and video occupy a larger market share.

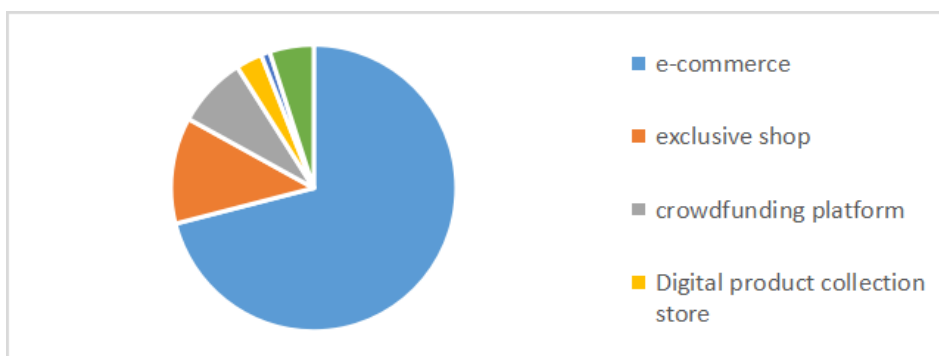


Figure 5. Percentage of sales channels

However, at present, the new products launched by various enterprises are mainly small intelligent furniture, and the interconnection between different products cannot be carried out. Therefore, affected by the epidemic, the smart home market has not developed. In other words, the future smart home market has great potential.

4. Company's position in the industry

4.1 The economic development

The leading enterprise of intelligent home appliances has established the barrier on cost and technology. The gap in cost and technology exists in new enterprises. Even if it leads under intelligent respect, it is difficult to become the head enterprise. Some enterprises choose to adopt the OEM mode, but most of them are second-tier enterprises, and there is still a certain gap between the products and the leading enterprises. At present, the market is dominated by traditional enterprises such as Haier, Midea, and Gree.

4.2 Threat of Substitutes

From the perspective of the intelligent home appliances industry, intelligent home appliances can mainly replace the old home appliances and traditional manual labor, forming a certain competitive advantage.

In the smart home industry, the product homogenization of various manufacturers is serious. The main leading enterprises include Gree, Midea, and Haier Smart Home. The products produced by smart refrigerators, smart water heaters, and smart washing machines are substitutes for each other. In response to the threat of substitutes, the giants have developed several competitive strategies.

Smart home appliance leading enterprises attach great importance to improving their R & D technology advantages, carry out the global layout, gradually establish a global R & D center at the same time, absorb and integrate the technical advantages of foreign brands. Haier's washing machines, for example, are centered on research and development in Japan, kitchenware and dishwashers are developed by FPA, and fridges are led by GEA of the US. In this way, global resources are consolidated on a single platform to meet the needs of different regions.

Formulate ecological brand strategy, with the help of blockchain, Internet of Things, and other tools, create their scene brand and operating system for smart home appliance field, to provide customers with personalized products and services.

Continue to expand the high-end home appliance market and launch high-end sub-brands. Previously, the domestic high-end home appliance market was divided by Siemens, Whirlpool, Philips, and other foreign brands, but the strategy of expanding the high-end market share promoted the development of China's high-end home appliance market.

4.3 Bargaining Power of Suppliers

The upstream link of the smart home can be divided into the transmission layer, perception layer, and processing layer.

Wireless communication chip is the core component of the transmission layer. Zigbee, Wi-Fi, and Bluetooth are the most widely used wireless communication in the field of the smart home. By 2020, the market share of overseas manufacturers in Wi-Fi, Zigbee, and Bluetooth chip markets is 80%, 90%, and 60% respectively. China's smart home chip suppliers have greater development space. Compared with the upstream smart home wireless communication chips, the overall production threshold of the wireless communication module industry is lower, the number of manufacturers is larger, the market concentration is more scattered, and the competition is more intense. Accordingly, the bargaining power of suppliers has been reduced. Compared with the upstream smart home wireless communication chips, the overall production threshold of the wireless communication module industry is lower, the number of manufacturers is larger, the market concentration is more

scattered, and the competition is more intense. Accordingly, the bargaining power of suppliers has been reduced.

The perception layer in the upstream link of a smart home is the sensor supplier. Sensor industry is a technology-intensive industry, which needs to invest a lot of scientific research capital and cutting-edge talents. In China's sensor market, more than 70% of the market share is occupied by overseas sensor suppliers, and the supply price of sensors is controlled by the overseas market. From this point of view, sensor manufacturers have higher bargaining power.

In the processing layer of the upstream link of the smart home industry, AI technology suppliers are mainly responsible for providing software and hardware products and solutions for smart home enterprises. Thanks to the continuous improvement of data accumulation, technology and underlying computing power in China's AI industry, China's AI industry continues to expand. In terms of AI technology and algorithm suppliers, the overall AI technology and algorithm supply tends to become platform, which reduces the accounting cost and development cycle for enterprises to independently hire AI development teams and improves the r&d efficiency. Therefore, suppliers related to the processing layer have high bargaining power.

4.4 Bargaining Power of buyers

Globalization of production leads to the globalization of sales, and most of the leading brands of smart home appliances have both domestic and overseas markets. Haier Smart Home, for example, has customers all over the world, including China, the United States, Europe, and Australia. The main sales channels are Amazon, Gome, Suning, and other large retailers. With the rise of e-commerce platforms and live delivery, enterprises sell directly to end consumers -- mainly young and middle-aged groups in first-tier and second-tier cities -- so their bargaining power is strength.

4.5 Fierce competition in the industry

In recent years, the smart home market has had broad prospects, attracting different types of companies to enter the industry, including Internet technology companies, traditional home appliance companies, and even real estate companies. The traditional home appliance head company adds the intelligent module to the perfect and mature product system. For example, Haier, Gree, and Xiaomi have all developed smart home production lines; several Internet and technology companies have opened markets through advanced intelligent technologies, such as Huawei, Apple, and Amazon. Several real estate companies launched the concept of fine decoration -- decoration after delivery -- using their own channel advantages to make a cooperate with home appliance enterprises.

With the development of technology, lack of industry talent, shortened product life cycle, and ease to imitate, the competition in the home appliance industry is becoming more and more fierce and the profit margin is decreasing.

5. Financial ratio analysis

In this section, we take *Haier Smart Home's* main financial indicators from 2016 to 2020 as the main research object. Through comprehensive analysis of the company's profitability, efficiency, solvency, and development capacity, and comparison with *Midea* and *Gree* in the same industry, we can judge the overall business situation and future development trend of *Haier Smart Home*.

5.1 Profitability

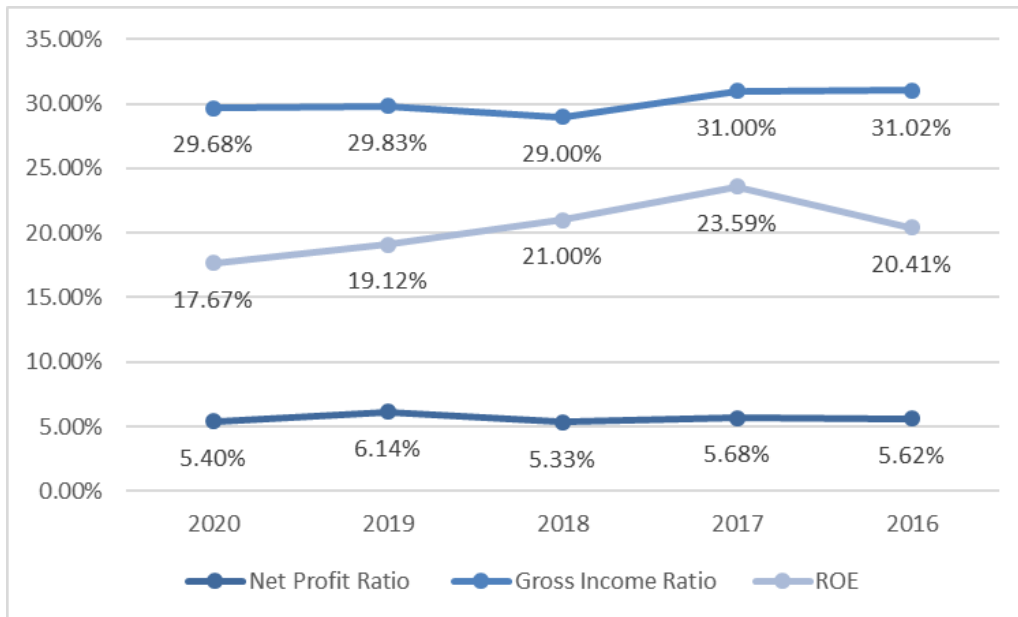


Figure 6. Profitability ratio of Haier Smart Home from 2016 to 2020

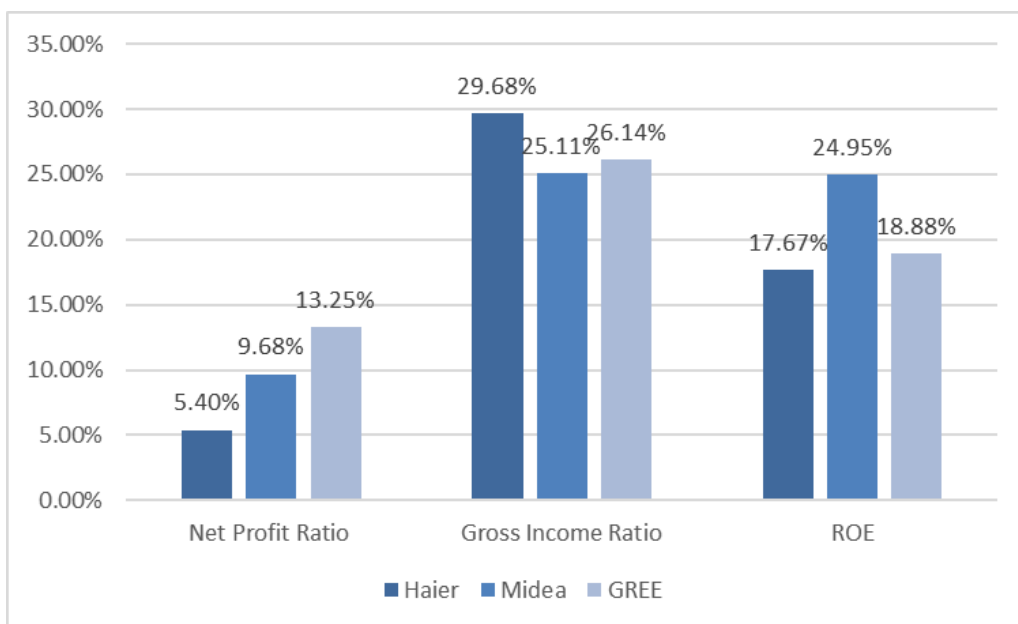


Figure 7. Comparative analysis of the profitability of Haier Smart Home, Midea and Gree in 2020

According to the financial report from 2016 to 2020, it can be calculated that the net profit Ratio of Haier Smart Home is far lower than the normal range of 20% to 30%, indicating that Haier Smart Home has a poor ability to obtain sales revenue. Meanwhile, in the past five years, Haier Smart Home's ROE and gross income ratio have generally declined. The reason is related to the increasing competition in the smart home industry, which leads most enterprises to reduce prices to increase their share. Sales gross margin decline is also related to raw material prices.

Through the analysis of the profitability of Haier Smart Home, Midea and Gree in 2020, it can be found that the gross income ratio of Haier Smart Home is similar to the other two, but the net profit ratio of Haier Smart Home is significantly lower than the other two. The main reasons are the additional management costs caused by the complicated equity system within Haier Group and the competition within the group for their respective sales performance.

5.2 Efficiency

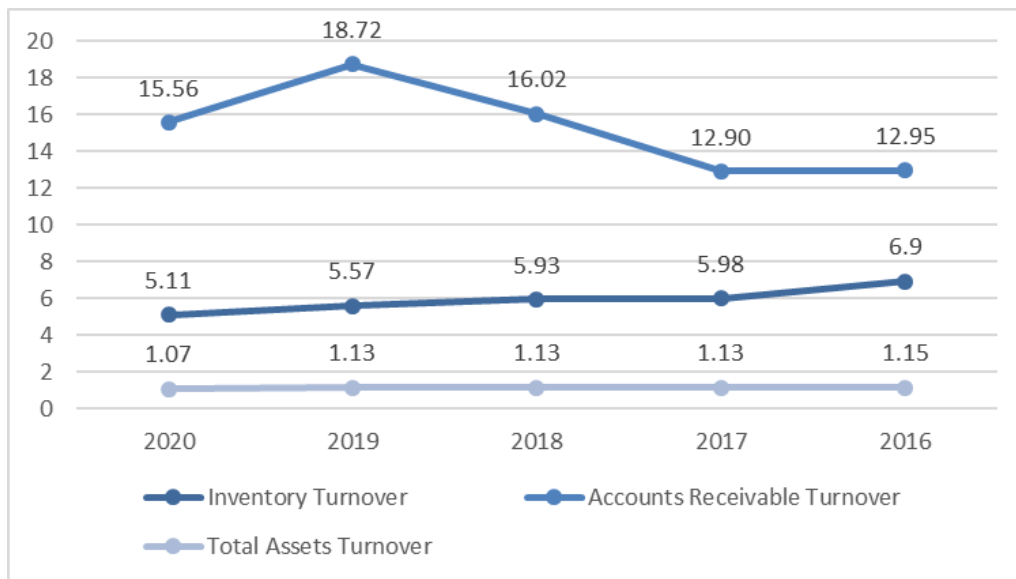


Figure 8. Efficiency ratio of Haier Smart Home from 2016 to 2020

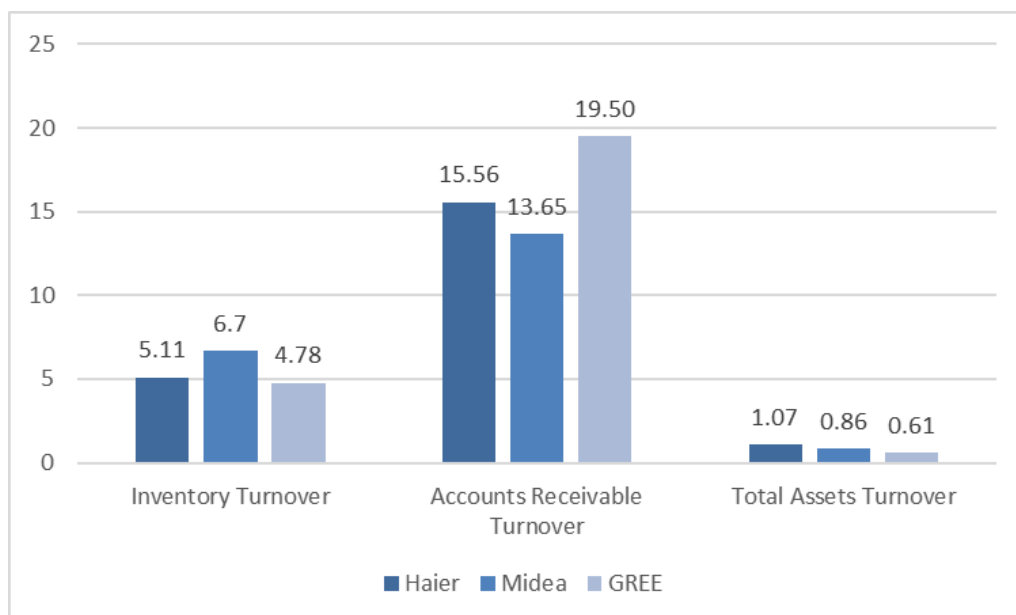


Figure 9. Comparative analysis of efficiency of Haier Smart Home, Midea, and Gree in 2020

Haier Smart Home inventory turnover and total asset turnover in the past five years are relatively stable. Accounts receivable turnover has a downward trend in 2020 because to cope with the fierce market competition, Haier smart home had to extend the credit term, resulting in funds being tied up for a long time.

By comparing the efficiency of Haier Smart Home, Midea and Gree in 2020, it can be found that the accounts receivable turnover and inventory turnover of Haier Smart Home are in the middle level, and the total asset turnover is greater than 1 and higher than the other two enterprises. This shows that Haier Group has strong sales ability and good asset investment returns.

5.3 Solvency

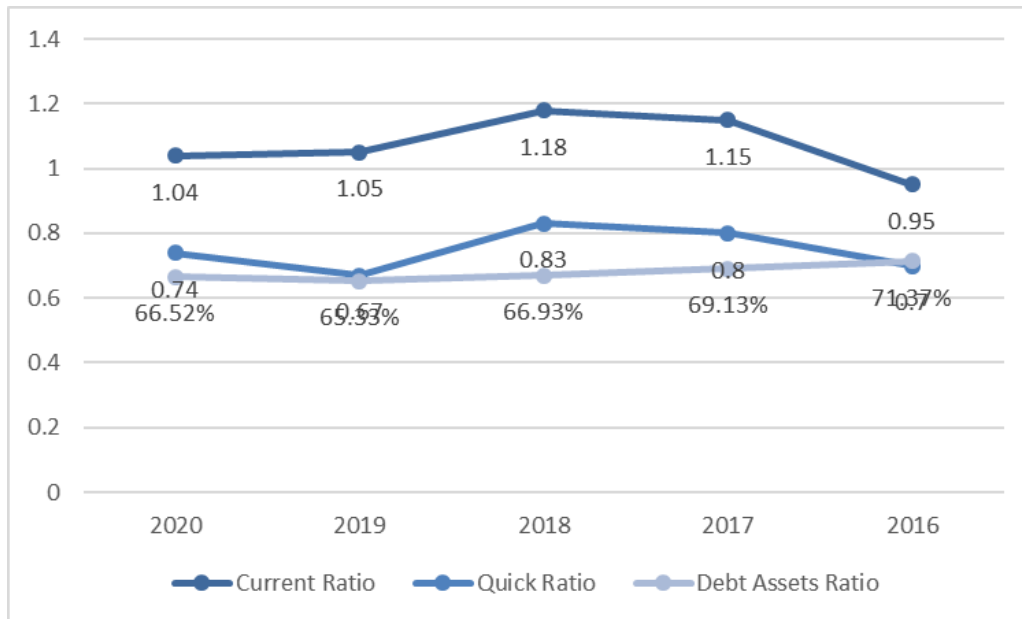


Figure 10. Solvency ratio of *Haier Smart Home* from 2016 to 2020

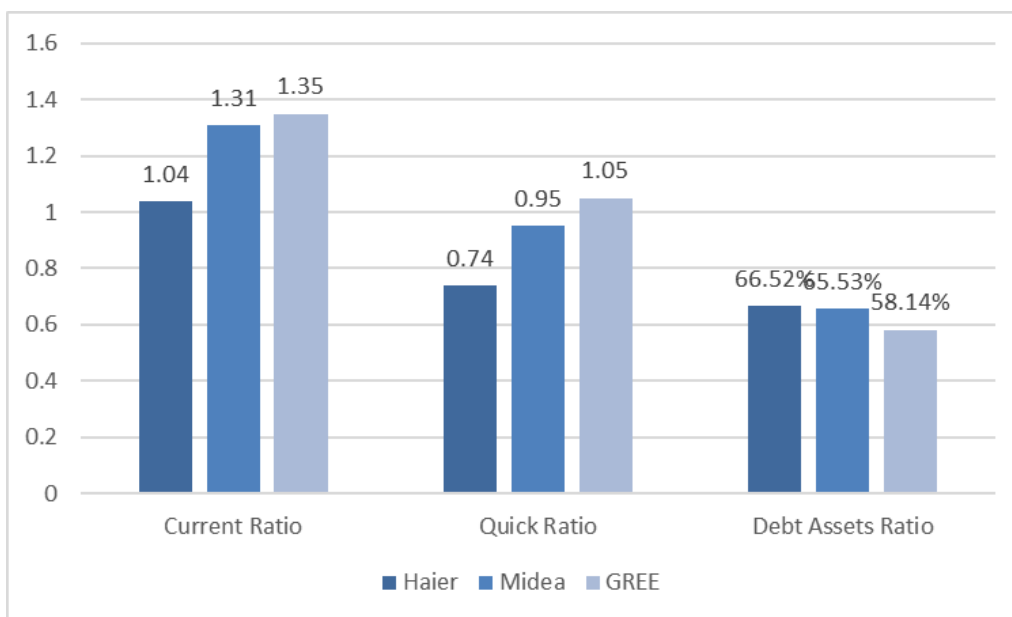


Figure 11. Comparative analysis of solvency of *Haier Smart Home*, *Midea* and *Gree* in 2020

Haier's current ratio and quick ratio have generally increased and then decreased in the past five years. They are obviously lower than the normal value of the quick ratio which is 1 and the normal value of the current ratio which is 2, and they are also lower than *Midea* and *Gree*. The main reason is that the company took on a lot of debt in 2016 to finance its acquisition of General Electric. Due to the maturity of some long-term loans in 2019, the current liabilities due within one year greatly increased, which reduced the liquidity of the enterprise.

The debt assets ratio of *Haier Smart Home* is slightly higher than the appropriate level of enterprise debt assets ratio which is 40%~60%. However, compared within the industry, it is still at the appropriate level.

5.4 Growth Capacity

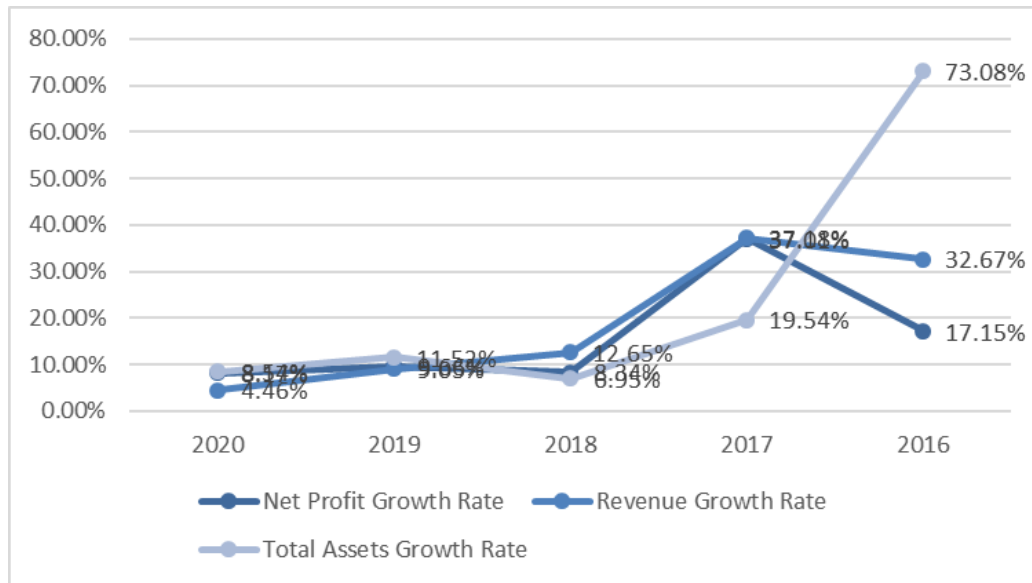


Figure 12. Growth capacity ratio of *Haier Smart Home* from 2016 to 2020

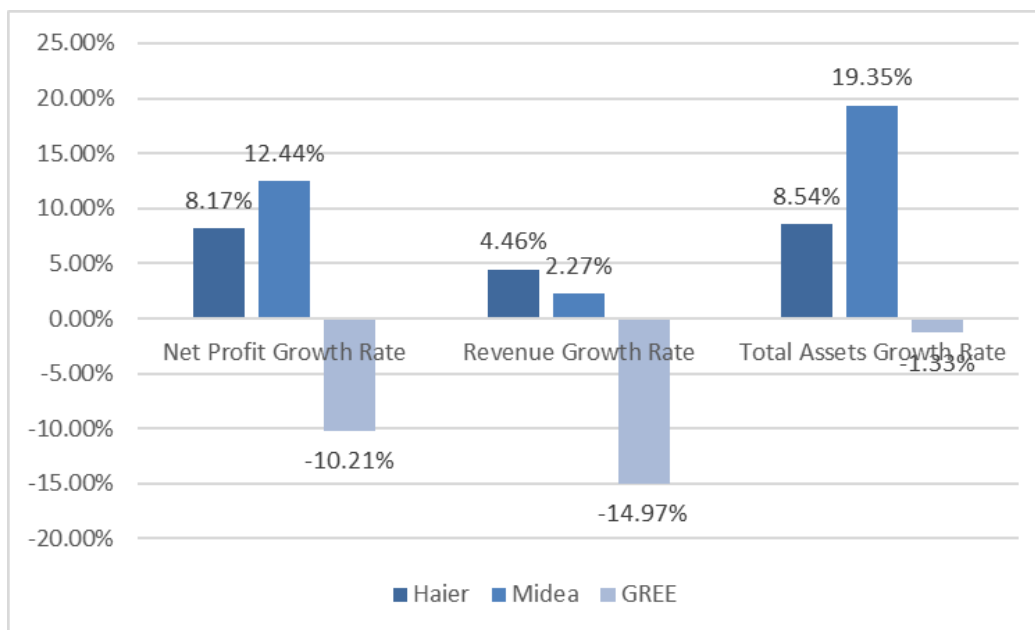


Figure 13. Comparative analysis of growth capacity of *Haier Smart Home*, *Midea*, and *Gree* in 2020

Influenced by the acquisition of General Electric in 2016, the growth rate of revenue, net profit, and total assets increased significantly, but the indicators gradually returned to the normal level after 2018. Due to the slowdown of macroeconomic growth, the overall development speed of the smart home market has been reduced. This trend is the reason why three growth rates are relatively low in the past three years.

Compared within the industry, *Haier Smart Home*'s net profit growth rate and revenue growth rate are at the leading level in the industry. Though the growth rate of total assets of *Haier Smart Home* is lower than that of *Midea*, it is still positive, indicating that *Haier* is developing at a stable speed.

6. Discussion

6.1 Development recommendation

Based on the above analysis of *Haier Smart Home* financial indicators and the future development trend of the smart home appliance industry, we put forward some suggestions for the future development direction of *Haier Smart Home*.

Haier Smart Home should integrate offline and online sales channels and transfer its focus to online sales channels. Due to the COVID-19, consumers are gradually shifting their consumption focus too online. *Haier Smart Home* will accelerate the construction of an online sales platform while continuously promoting the diversification of offline sales channels. Live broadcasts can be launched to reflect product functions, enhance users' sense of involvement and stimulate consumers' purchasing power.

Haier Smart Home can improve the proportion of customized products. Customized products can be delivered directly to the user's home after production, saving storage costs and not occupying inventory. Thus, customized products can improve inventory turnover.

Haier Smart Home should stabilize the domestic market while expanding foreign markets. Different strategies should be used in different parts of the world. In Europe and the United States, more emphasis should be placed on the concept of energy conservation and environmental protection, and in Asia and Africa, more emphasis should be placed on durable and cost-effective performance. At the same time, we should also pay attention to the potential development of the rural market in China.

On July 31, 2020, the company announced the privatization plan of *Haier Electric Appliances*. After the completion of privatization, *Haier Smart Home* will have new opportunities. The efficiency of internal management is expected to be promoted. Internal consumption caused by redundant personnel and complex processes will be greatly reduced, resulting in a faster turnover, lower financial expense ratio, and more appropriate capital structure.

In the long term, privatization is expected to be an inflection point for the improvement of the company's profit performance and help the company become the leader in the next stage of the development of the smart home industry.

6.2 Smart home development trend

Proactive: Smart home systems can automatically monitor the family situation, predict the potential danger, and take action. In addition, it can also obtain consumers' living habits data, conduct data mining and analysis, and connect the analysis results with third-party service providers to provide personalized services to consumers.

Scenarioization: In the future, a unified industry-standard access port and operation platform must be established. The combination of different product states can meet the needs of customers in different scenes in the same space. In this way, manufacturers can focus on research in the field of small segmentation.

Standardization: Due to the high price and cumbersome installation of intelligent products, there will be standardized intelligent design schemes for different house types in the future. This will greatly reduce the cost of buying and decorating for customers.

Finally, the smart home system will gradually be unified from the bottom system to achieve multi-device collaboration. Consumers can easily switch between multiple-use scenarios to meet different needs and truly realize whole-house intelligence.

7. Conclusion

This paper takes *Haier Smart Home* as an example to analyze the future development trend of the smart home industry. We use PESTAL model to analyze the macro environment of *Haier Smart Home* from the aspects of policy, economy, society, environment, and regulations. Porter's Five

Forces model is used to analyze the upstream and downstream of the smart home industry chain and the intensity of competition. Using the method of financial analysis, this paper analyzes the financial situation of Haier Smart Home from the aspects of profitability, efficiency, solvency, and growth capacity. This paper also put forward suggestions for the future development strategy of Haier Smart Home and forecast the future development trend of the smart home industry.

Through the analysis, we found that the macro environment of smart homes has been supported in policy, economy, society, and environment, but there is a lack of legislation. For the smart home industry, although it is difficult for new competitors to enter and the industry has strong bargaining power on the upstream and downstream, the substitutability of products is high, and the competition in the smart home appliance industry is very fierce. In terms of financial indicators, *Haier Smart Home's* profitability and growth capacity are mediocre, and it has advantages in efficiency, but it should be alert to the risk of solvency. In this regard, we believe that the business situation of Haier Smart Home will improve after the completion of privatization, and the smart home industry will develop towards a proactive, and standardization trend in the future.

Although this article analyses the future development trend of the smart home industry to a certain extent, there is a certain lag in judging the development trend due to the difficulty in obtaining internal data and the latest data. At the same time, this paper mainly focuses on the Chinese market and does not discuss the current situation of the international market. The universality of its conclusion in the international market needs to be further demonstrated. With the further development of the smart home industry, relevant academic achievements can be enriched from the perspectives of the international market and corporate management motivation.

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