



Market Analytics for Providing Better Consumer Services

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Abstract. Prologic Robotics is a local brand based in Hong Kong, established in 2010. The Prologic Robotics brand team focuses on developing cutting-edge intelligent automatic robots and launched the intelligent automatic vacuuming robot in the same year, committed to simplifying people's lives through technology. In order to expand its influence in the market, we have conducted market analysis of Prologic using IBM data analysis technology. Firstly, we collected and organized a large amount of market data, including market share, consumer demand, and competitors' information, based on its target market (Hong Kong). Secondly, we conducted descriptive statistical analysis to help Prologic understand the basic features of the data, such as mean, median, standard deviation, and the distribution of the data, in order to better understand market trends and consumer demand. Then, we used time series analysis, regression analysis, and machine learning algorithms to conduct predictive analysis, which helps the Prologic brand predict future market trends. Finally, we conducted market data mining for Prologic, helping the company discover patterns and relationships hidden in the data. In the future, in order to expand Prologic's market competitiveness, we will continue to collect and organize market data from foreign markets (such as Seoul, Tokyo, Taipei, and Singapore) that Prologic benchmarks against, and continue to track and analyze Prologic's market performance using IBM data analysis technology, providing more specific and accurate market analysis reports for the company. We believe that through these market analysis efforts, Prologic will be able to better meet consumer demand, improve market competitiveness, and achieve sustainable development.

Keywords: Data analytics, Machine learning algorithm, Market analysis.

1 Introduction

1.1 Principles of Market Analysis

Market analysis (MBA Library. (n.d.)) is an essential element for modern businesses and markets. It refers to the process of analyzing the market and its sales changes based on existing market research data, using statistical principles. It plays a crucial role in many areas. From a marketing perspective, it is a part of market research and a prerequisite

for effective marketing strategies. From a market forecasting perspective, it is a necessary preparatory process. Only by conducting a thorough market analysis can a good market prediction be made. Market analysis involves many disciplines, such as economics, statistics, sociology, and others. Therefore, it is worth learning and understanding. Through the learning process, we can gain valuable knowledge related to the market that can be applied in our future studies and work.

Effective market analysis is critical for any business strategy, as it helps companies understand their target audience, product demand, and competition. To learn and understand market analysis, it is not enough to only study theoretical knowledge and techniques. Therefore, we have decided to learn market analysis through practical experience by selecting Prologic (Prologic Robotics Website, 2021) as our company for market analysis. Through conducting a comprehensive market analysis and developing specific strategies, we aim to learn market analysis in a practical way. Additionally, a thorough market analysis can help Prologic gain a better understanding of the current trends, demands, and challenges in the robotics industry, which can lead to more targeted marketing strategies.

1.2 Purpose and Significance of Market Analysis

The primary purpose of market analysis is to explore potential markets, assist companies in formulating more targeted and rational marketing strategies, and identify potential sales opportunities for their products. Through market analysis, companies can gain a better understanding of their competitors, key marketing areas, and the supply and demand relationship for their products, ultimately increasing their sales and economic benefits. The significance of market analysis lies in its role as the foundation for developing more suitable marketing strategies and using the most scientific methods to market products, reducing the risks associated with business operations. Additionally, market analysis serves as a timely check. Regular market analysis can help businesses detect problems and errors in their operations, correct them in a timely manner, and optimize their strategies. This is also an essential guarantee for ensuring that businesses continue to develop on the correct path.

2 Brand Basic Information

2.1 Brand Background

After selecting the company for our market analysis, we conducted a systematic investigation into its background, brand concept, marketing strategies, target benefits, and more.

PROLOGIC ROBOTICS is a local brand based in Hong Kong that was founded in 2010. The brand continues to develop cutting-edge intelligent robots and launched its first intelligent automatic vacuum cleaner robot in the same year. The brand's team specializes in researching and developing advanced intelligent automatic robots, dedicating themselves to simplifying people's lives through continuous innovation and

research. This brand immediately gained attention in various markets. To date, PROLOGIC ROBOTICS has created the H-MOTION and V-MOTION series, which are the core flagship series of the brand. The brand sells both online and offline and has over 60 sales points in Hong Kong and Macau.

2.2 Brand Concept

The brand concept of PROLOGIC ROBOTICS is continuous innovation. Innovation remains the most crucial factor in the growth of PROLOGIC ROBOTICS, and the brand will continue to maintain its innovative spirit, adhere to the principle of product quality responsibility, and provide practical and efficient products. Through our brand's products, every customer can experience the brand concept of PROLOGIC ROBOTICS, such as "ALWAYS BE YOUR HOME PARTNER," and enjoy a cleaner, easier, and superior home living experience.

2.3 Brand Product Development Process

The product development process of PROLOGIC ROBOTICS began in 2010 with the development of the first Prologic Robotics intelligent automatic vacuum cleaner robot, which was officially launched in the market. In 2014, the first intelligent automatic window cleaning robot was also developed with the aim of providing users with a cleaner, easier, and superior home living experience. The first intelligent automatic floor scrubber robot, the H700, was officially launched in the market, adding more diversity and innovation to the H-Motion and V-Motion product lines. In 2021, the iplushome APP was also created, bringing new experiences to users.

Through an in-depth understanding of PROLOGIC ROBOTICS, we gained a clear understanding of their main marketing strategies and target market. Following this, we conducted a market analysis of the brand.

2.4 Brand Objective

The company's product and business decisions are focused on home applications, which is a decision that aligns well with market trends and has high growth potential. PROLOGIC ROBOTICS' current product features include unique customer-preferred functions such as safety features and dynamic water floor cleaning. The company's main target market is the Hong Kong region, with a focus on designing floor cleaning robots that cater to the needs of Hong Kong households.

3 Specific Process of Market Analysis

3.1 Market Analysis Objective

In the initial stages of conducting a market analysis, we first need to determine the target audience for PROLOGIC ROBOTICS' products, such as consumers, businesses, or industries. Next, we can study the current market trends and demands for robot

technology, including the most popular types of robots, the most common use cases, and the key features that customers are looking for.

In addition to this, we also need to understand and analyze the competition in the market, including their products, pricing strategies, marketing strategies, and customer base. This can help PROLOGIC ROBOTICS identify gaps in the market that they can fill, as well as potential collaborations or partnerships with other companies. Based on the insights gained from the market analysis, PROLOGIC ROBOTICS can develop tailored marketing and sales strategies aimed at attracting their target audience and standing out from their competitors. This may involve developing new products or features, adjusting pricing or promotional strategies, or expanding their sales channels.

3.2 Data Collection

After determining the direction of the analysis, we collected and organized a large amount of market data based on the target market of Hong Kong. We collected information on market share, consumer demand, and competitors to understand the situation and trends in the robot market. By gathering sales data, market share, and competitor data, we can better identify the hotspots and trends in the robot market and analyze the performance of our products in the market. This not only helps us understand the overall situation of the market but also helps us better understand consumer needs and behavior patterns, allowing us to develop more accurate public relations strategies.

We particularly focused on the indicator of consumer demand. We collected a lot of information on consumer demand. Understanding consumer demand is an important basis for formulating public relations strategies because consumer demand directly affects product sales. We collected evaluations from different brands and regional outlets to understand consumer demand, including their demand for robot products, usage habits, purchasing budget, and so on. These data can help us better understand consumer needs and preferences, and then formulate more accurate public relations strategies to increase the market share and sales volume of the product.

Meanwhile, we also paid attention to some important indicators such as market share. Market share refers to the proportion of sales of a specific brand, product, or service to the total sales of a specific market. By analyzing market share, we can understand the competitive landscape of different brands and products in the market. By analyzing the trend of market share changes, we can understand the market performance of each brand or product and adjust our public relations strategies in a timely manner to respond to market changes.

Furthermore, we conducted in-depth research on our competitors. By understanding their product features, pricing strategies, marketing strategies, and other information, we can gain a better understanding of the competitive landscape in the market and develop more effective public relations strategies. In the floor cleaning robot market, there are many outstanding brands such as Xiaomi, Stone, and Ecovacs, which are popular both domestically and internationally. We specifically looked into the sales data and market share of these brands in our target market (Hong Kong), and through analysis, we found that they have a significant market presence and are recognized as top brands in Hong Kong.

3.3 Data Analysis

Data analysis refers to the use of statistical analysis methods to analyze a large amount of collected data. By organizing and summarizing the data, and then understanding and digesting it, we can maximize the functionality of the data and utilize it to its fullest potential. In general, data analysis is the process of extracting useful data and information, and then forming detailed conclusions and summary statements after understanding and digesting the data. In practical applications such as market analysis, data analysis can help companies make judgments and take appropriate action, making it a valuable tool for market analysis.

3.4 Consumer Review Analysis

To help PROLOGIC ROBOTICS further expand its market influence, we conducted data analysis on the collected data related to PROLOGIC ROBOTICS using data analysis techniques. In the preparatory work, we scraped customer reviews from the Amazon shopping website (as shown in Fig. 1). Table 1 shows the information of the dataset. The reviews were from 1 March to 25 June, 2023 and included brands such as Ecovacs, Shark, Tikom, Coredy, etc., and regions such as Hong Kong, the United States, Mexico, etc. (with Hong Kong as the main region), totaling 200 comments. As shown in Fig. 2 and Fig. 3, high-frequency words were extracted. By extracting the comments, we can identify the most frequent high-frequency words that appear in all the comments.

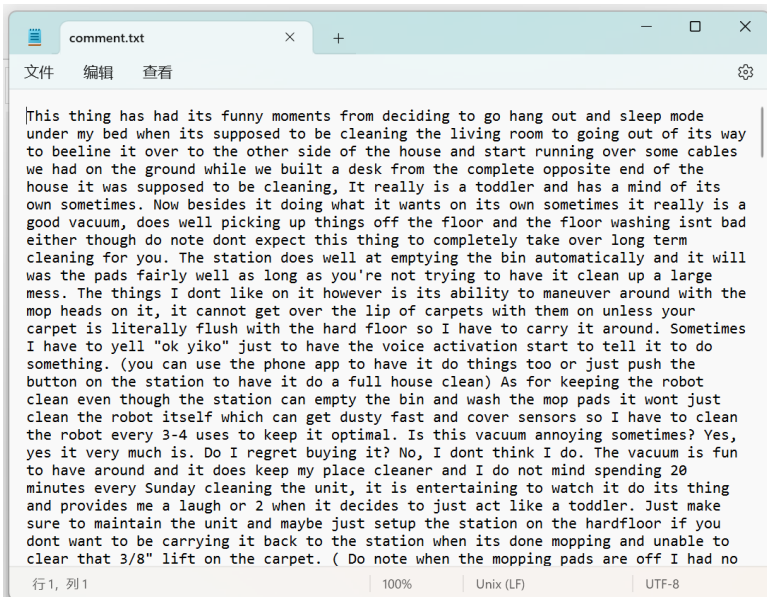


Fig. 1. We collect reviews of different brands and outlets in different regions.

Table 1. The information of our dataset.

Characteristics	Value
During of reviews	1 March 2023 - 25 June 2023
Band included	Ecovacs, Shark, Tikom, Coredy, etc.
Regions of reviewers	Hong Kong, the United States, Mexico, etc. (Hong Kong as the main region).
No of comments	200

```
1 # -*- coding: utf-8 -*-
2 import nltk
3 from wordcloud import WordCloud
4
5 nltk.download('punkt')
6
7 input_file = 'comment.txt'
8 output_file = 'output.png'
9
10 text = open(input_file, 'r', encoding='utf-8').read()
11 text = ' '.join(nltk.word_tokenize(text))
12 cloud = WordCloud(background_color='white').generate(text)
13 cloud.to_file(output_file)
14
```

Fig. 2. Codes used to extract high-frequency words.

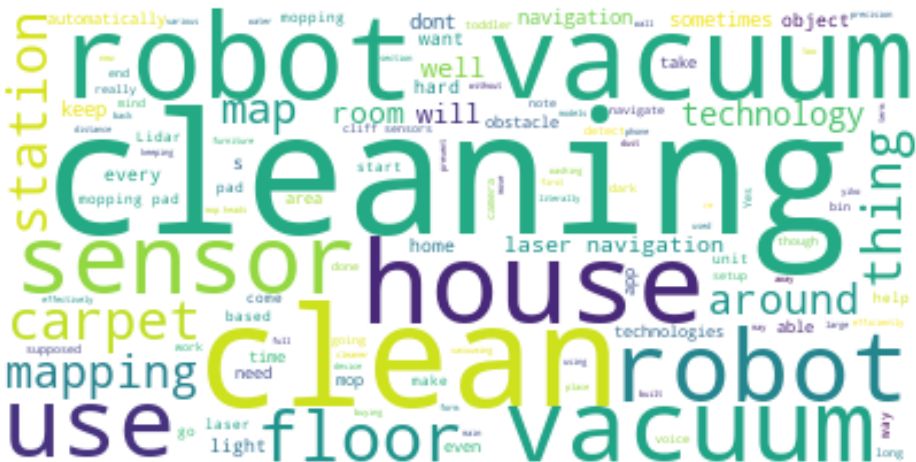


Fig. 3. We extracted high-frequency words from these comments, and here are the results of the extraction.

After extracting high-frequency words, we cleaned and preprocessed the data by removing useless characters and punctuation, and dividing the text into words or phrases. After counting the word frequency, we filtered out stop words, which are high-frequency words or phrases that have no actual meaning in the text, such as "the" and "of". We used NLTK (Natural Language Toolkit) in Python to filter out these stop words. The final step is to sort and display the results by sorting the counted results in descending order of word frequency and displaying them.

After extracting the high-frequency words, we found that the most frequently occurring words were cleaning, robot, sensor, vacuum, carpet, station, and so on. These high-frequency words reflect consumer's focus on the product's functionality and effectiveness.

The words "cleaning", "robot", and "carpet" have the highest frequency of occurrence, indicating that consumers are most concerned about the floor cleaning robot product itself. This shows that consumers value the cleaning ability of the robot most, which is the most basic requirement for floor cleaning robot products. For difficult-to-clean areas such as carpets in daily life, whether the floor cleaning robot can clean them thoroughly is also a key focus of many consumers. Many people compare floor cleaning robots with vacuum cleaners and compare their functions, hoping to choose a cost-effective cleaning tool. Compared with vacuum cleaners, floor cleaning robots have many advantages, the most prominent of which is full automation. Most floor cleaning robots on the market today have map scanning functions, which can avoid obstacles such as furniture when cleaning the room, preventing collisions. After cleaning, the robot can also automatically return to its fixed position, which is very convenient. This shows that sensors, map scanning, and other advanced functions are important advantages of floor cleaning robots, and words such as "sensor", "vacuum", and "station" also appear frequently. This also indicates that some consumers value the unique smart advantages of floor cleaning robots when purchasing products.

By analyzing these high-frequency words, we can understand consumers' specific needs, including their demand for robot products, usage habits, functional requirements, and so on. After understanding consumers' needs, the company can focus on them in its marketing efforts to attract consumers and maximize the effectiveness of its advertising, making more people choose the PROLOGIC ROBOTICS brand when purchasing floor cleaning robots.

At the same time, after the company has a clear understanding of consumer needs for the product, these needs should also be taken into account as a focal point for improving and upgrading the product in the subsequent development process.

3.5 Hong Kong Market Analysis

By analyzing high-frequency words, we can gain a more comprehensive understanding of customers' psychological activities. The reason why consumers are concerned about these words is that they may have tried traditional cleaning methods but found them

both cumbersome and time-consuming, as well as inefficient. They may hope to solve these problems by purchasing high-end robotic vacuum cleaners to improve the efficiency and quality of home cleaning. Customers have a high interest in smart home (Hayes, 2022) devices and automation technology and have higher expectations for the intelligence and automation functions of robotic vacuum cleaners.

As PROLOGIC ROBOTICS' main target market is Hong Kong, we have conducted a detailed analysis of the Hong Kong market, including policies introduced by the Hong Kong government, per capita GDP in Hong Kong, the aging population in Hong Kong, changes in the Hong Kong population, and per capita spending in Hong Kong, among others.

The Hong Kong government's 2023-2024 fiscal budget emphasizes the importance of developing intelligent industries (automation, IoT, artificial intelligence) in Hong Kong. The "Hong Kong Science and Technology Innovation Development Blueprint" elaborates on how innovative technology can create new industries and enhance traditional industries, thereby driving economic development. PROLOGIC ROBOTICS can break the conventions of the traditional cleaning industry and take advantage of this opportunity to grow and dominate the intelligent cleaning robot market in Hong Kong.

To determine the age demographic market for our target market, we analyzed the current age structure in Hong Kong as shown in Fig. 4 (Census and Statistics Department, 2017). After collecting and surveying the data, we found that Hong Kong is currently facing a serious aging population issue. Studies have shown that the aging of the Hong Kong population is expected to continue, with the pace accelerating significantly over the next 20 years. It is estimated that by 2030, the proportion of elderly people in Hong Kong will reach 27% and will continue to grow at a rate of approximately 2% to 4% per year.

Population size and age structure (excluding foreign domestic helpers)

人口 (百萬人)

Population (millions)

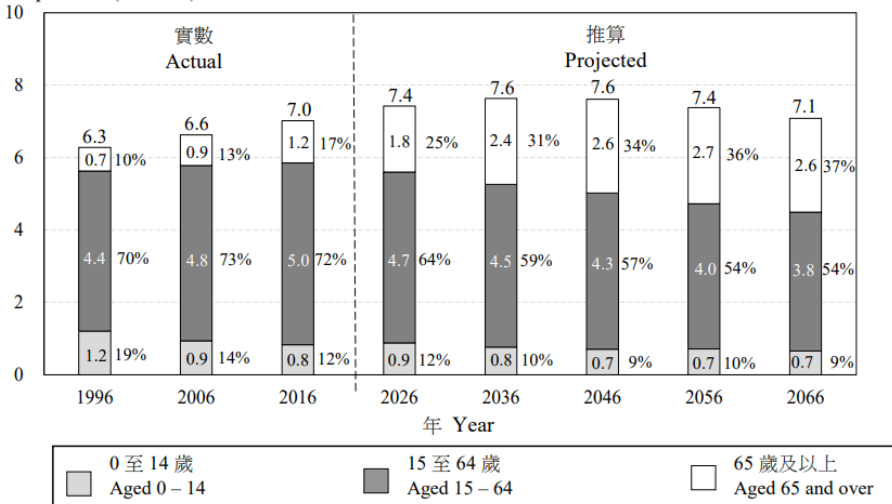


Fig. 4. Population age structure map (Census and Statistics Department, 2017)

From this, it can be seen that the trend of population aging will not change in the coming decades, and the demand for service robots in the market will also increase. PROLOGIC ROBOTICS' floor cleaning robot belongs to the service robot category, which can perfectly solve the problem of inconvenient movement and difficult cleaning for the elderly. PROLOGIC ROBOTICS' floor cleaning robot can achieve fully automatic cleaning, with a one-button cleaning function that can clean the entire room with just one touch. In the face of the increasing aging population, we believe that the demand for floor cleaning robots in the Hong Kong market will continue to increase. Therefore, the company should start to pay attention to the specific needs of the elderly for floor cleaning robots, conduct timely investigations and collect data, and make it a key focus in promoting its products.

When analyzing data such as Hong Kong's per capita GDP, population changes, and per capita spending, we used descriptive statistical analysis methods. Descriptive statistical analysis is a method used to describe the basic characteristics of data, which can help us understand information such as the distribution of data, central tendencies, and variability. We used indicators such as mean, median, and standard deviation to conduct descriptive analysis of the data. The mean refers to the average value of a set of data, which can help us understand the overall performance of the market. The median is the value that is in the middle of a set of data when they are arranged in order, which can help us understand the distribution of the data. The standard deviation is a measure of the degree of variability of a set of data, which can help us understand the variability of the market data.

Per capita GDP can reflect the level of affluence and economic development of a region to a greater extent than the total GDP, and a detailed understanding of the target market's per capita GDP can help to price the product more reasonably and control the production volume more effectively, maintaining a balance between the supply of goods and purchasing power. Fig. 5 shows the per capita GDP of Hong Kong (CEIC, n.d.-b). Currently, Hong Kong's per capita GDP is generally showing an upward trend, with a slight decline around 2020 due to the impact of the pandemic. From 2020 to 2022, it has fluctuated due to the pandemic, but has basically returned to its previous level by 2022. We believe that pricing of products should take into account the impact of the pandemic and make adjustments compared to before. At the same time, the company should always pay attention to per capita GDP, which is a very important reference value, and adjust the pricing and total production volume of its products according to changes in the data, striving to maintain a balance between supply and demand.

The formula for calculating GDP per capita:

$$x \div y = z$$

x= Total GDP

y= Average Annual Population

z=Per Capital GDP

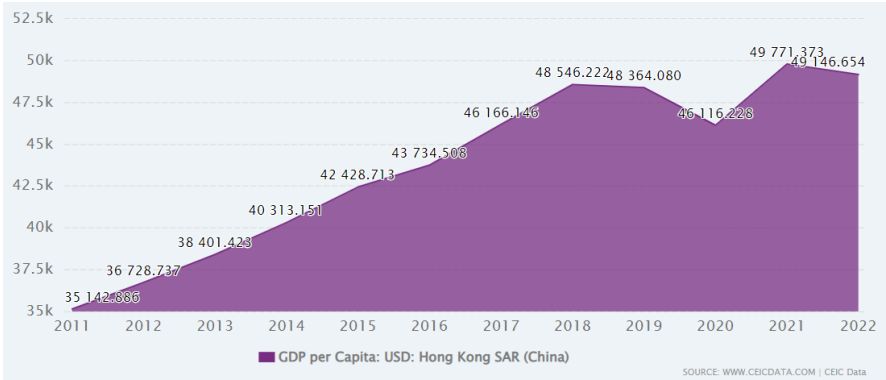


Fig. 5. Per capita GDP of Hong Kong. (Hong Kong SAR, China GDP per capita.)

In addition to per capita GDP, we also analyzed the current employment situation in Hong Kong. Table 2 shows the current employment situation in Hong Kong (Trading Economics, n.d.). By comparing data from two periods, we found that the number of employed persons and productivity have increased, while the labor force participation rate has remained unchanged. These findings indicate that the impact of the pandemic on the Hong Kong economy is gradually decreasing to some extent.

Table 2. The current employment situation in Hong Kong.

Hong Kong	Recent Data	Last Data	Unit	Reference Date
Unemployment	3.00	3.00	%	May 2023
Unemployed personnel	113.10	114.40	thousand	May 2023
Employed personnel	3673.80	3655.90	thousand	May 2023
Labor force participation	57.60	57.70	%	May 2023
Productivity	110.30	105.90	integral	Dec 2021

Note. From (Hong Kong - Employment 1981-2023 Data: Forecast 2024-2025, by Trading Economics, n.d.)

Fig. 6 shows the per capita expenditure in Hong Kong (CEIC, n.d.-a). Per capita consumption expenditure refers to the total expenditure of residents on daily household consumption, including expenditures on physical goods and services. Per capita consumption expenditure is the main body of social consumption demand, a direct factor in driving economic growth, and an important indicator of the quality and standard of living of residents (MBA Library, n.d.). Hong Kong's per capita consumption expenditure has been increasing year by year since 1995, which not only reflects the improvement of people's living standards but also indicates an increase in consumption of daily necessities. With the increase in consumption levels, people's pursuit of home products has gradually become more fashionable, convenient, and international, especially among younger consumer groups. Intelligent home products such as floor cleaning robots are also increasingly popular among young people. A smart home refers to a

convenient home setup where appliances and devices can be automatically controlled remotely from anywhere with an internet connection using a mobile or other networked device (Hayes, 2022). Therefore, in the current trend of furniture becoming increasingly intelligent, PROLOGIC ROBOTICS should promote the intelligence, fashion, and technology features of its products, aiming to capture the young market and make more young people choose PROLOGIC ROBOTICS products.

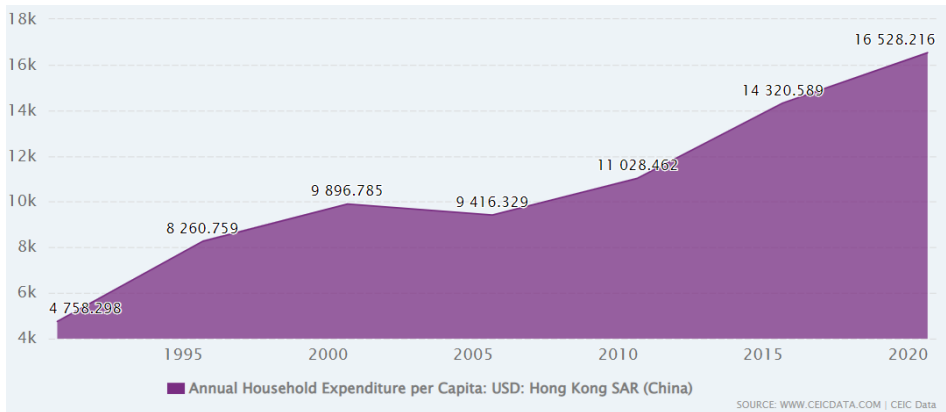


Fig. 6. Per capita expenditure in Hong Kong (Hong Kong HK: GDP: 2010 price: USD: Household final consumption expenditure per capita).

3.6 Competitive Brand Analysis

Regarding the well-known brands in the floor cleaning robot market, we specifically looked into their sales data and market share in our target market (Hong Kong). We also paid special attention to the strengths and weaknesses of these popular brands and learned from their competitive strategies. Through analysis, we developed more accurate counter strategies to improve the market share and competitiveness of our product. During our analysis of consumer reviews, we gained a clear understanding of consumer needs and points of concern for the product. Competing brands also continuously upgrade their products based on these needs, and we collected consumer reviews from different brands to help the company make the right product optimizations and learn from other brands' successful improvements, correcting or avoiding those with poor feedback.

4 Conclusion

4.1 Future Work

In the future, to expand Prologic's market competitiveness, we will continue to collect and organize market data from benchmark foreign markets such as Seoul, Tokyo,

Taipei, and Singapore, and use IBM data analysis technology to track and analyze Prologic's market performance, providing the company with more specific and accurate market analysis reports. We believe that through these market analysis efforts, Prologic will be able to better meet consumer needs, improve market competitiveness, and achieve sustainable development.

4.2 Summary

Through this data analysis, we not only gained deeper market insights and improved the precision and feasibility of our public relations strategies, but also learned much knowledge related to data mining, data organization, data cleaning, and data analysis. This will be of great help to our future learning and career development.

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