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60 Years of Growth, Innovation and Leadership

Market Research on Global Commercial Service Robots (2023)

A Frost & Sullivan Industry Research

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Executive Summary

Introduction

The commercial service robots market has a promising future, with broad application areas, strong demand, and significant growth potential, indicating that the market is entering a period of rapid expansion.

The global commercial service robots industry is entering a period of rapid expansion, characterized by a promising future, broad application areas, robust demand, and immense growth potential. With the surge in market demand, the diversification of application scenarios, and technological advancements, the industry is poised to maintain a rapid growth in the coming years. Continuous innovation and optimization in commercial service robots will further enhance service quality and efficiency, meeting the diverse needs of the global market and driving sustainable growth and competitiveness.

1. **Surging Market Demand Driving Rapid Industry Development**

- With the acceleration of global automation and intelligence processes, the commercial service robots industry is encountering unprecedented development opportunities. The demand for commercial service robots is continuously growing worldwide, especially driven by high labor costs, increasing service quality requirements, and a strong trend toward automation. It is estimated that by 2030, the global commercial service robots market will nearly USD1.5 billion, with a CAGR (2024-2030) of 20.3%. The demand growth is primarily driven by changes in population structure, rising labor costs, increasing service quality requirements, and the advancement of intelligent trends.

2. **Diversification of Application Scenarios Driving Further Market Expansion**

- The widespread application of commercial service robots across various industries, including catering, hospitality, retail, healthcare, financial services, education, and public services, has fueled rapid market growth and diversified development. For instance, in the catering, hospitality, and retail industries, commercial service robots solutions such as delivery robots, restaurant service robots, and intelligent shopping guide robots not only improve service efficiency and customer experience but also significantly reduce labor costs. For example, restaurants using delivery robots can save over 30% on labor costs on average, while increasing service efficiency by approximately 20%. Similarly, the use of robots in the hotel and retail sectors has greatly improved operational efficiency and customer satisfaction.

3. **Technological Advancements Driving Industry Innovation, Enhancing Depth and Breadth of Applications**

- The continuous integration of artificial intelligence, big data, IoT, and multi-modal technologies has endowed commercial service robots with higher levels of intelligence, stronger interactive capabilities, and broader application scenarios. These technological advancements have not only improved the performance and functionality of robots but also significantly reduced usage costs, enabling commercial service robots to be widely applied across more fields. For example, AI has enhanced robots' autonomous learning abilities, decision-making capabilities, and interaction levels, IoT has realized device interconnectivity, and the development of multi-modal technologies has promoted the universality of robots, etc.

4. **Rising Industry Concentration Fueling Standardization and Normative Development**

- As the commercial service robots market rapidly expands, industry competition is becoming increasingly intense, and industry concentration is further rising, with leading companies gaining more prominent advantages. Companies are continuously enhancing their market shares through technological innovation, strict quality control, and comprehensive after-sales services. Chinese companies have shown significant strengths in technology research and development, global expansion, and international strategies. These companies actively expand their presence globally by launching high-performance intelligent delivery robots, professional cleaning robots, reception robots, and shopping guide robots, continually increasing brand influence and market share. Their global expansion and international strategies have quickly established them as industry leaders, driving the standardization and normative development of the industry.

Methodology

- Frost & Sullivan has established a strong presence in the global market, conducting in-depth research across 19 major industries and 532 vertical markets, accumulating nearly one million industry research samples and completing over 10,000 independent consulting projects.

- Frost & Sullivan's research spans the entire industry lifecycle, including the founding, development, expansion, and maturation stages of companies, and also including their journey to IPO and post-IPO phases. Researchers at Frost & Sullivan explore and evaluate the evolving industrial models, business models, and operational strategies within these industries, providing professional insights into industry trends.

- Frost & Sullivan combines traditional and innovative research methodologies, utilizing proprietary algorithms and industry-wide big data. By employing diversified research methods, Frost & Sullivan uncovers the logic behind quantitative data, analyzes the perspectives behind qualitative content, and presents an objective and accurate depiction of the industry landscape. Frost & Sullivan's reports offer forward-looking predictions on future industry trends, capturing the past, present, and future of the industry.

- Frost & Sullivan closely monitors the latest developments in industry trends, ensuring that report content and data are continuously updated and refined in response to industry evolution, technological advancements, competitive landscape shifts, policy and regulatory changes, and deeper market research.

- Committed to meticulous research and continuous improvement, Frost & Sullivan analyzes industries from a strategic perspective and interprets them from an operational viewpoint, providing each report reader with valuable and insightful industry research.

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Global Commercial Service Robots Market Analysis

1.1 Definition and Classification of Commercial Service Robots

Commercial service robots refer to intelligent robots that provide systematic services in the commercial service sector. These robots are capable of performing tasks such as delivery, guidance, and cleaning, which are widely used in fields such as catering, hospitality, and public services.

- **Commercial service robots** refer to intelligent robots specifically developed to meet industry demands, designed to provide systematic services in the commercial service sector.
- Commercial service robots are equipped with the ability to move autonomously and interact with humans, capable of performing tasks such as delivery, guidance, and cleaning. They are widely applied in various fields, including **catering, retail, hospitality, industrial settings, healthcare, eldercare, education, and public services**, etc. Based on their functions, commercial service robots are typically classified **into commercial cleaning robots, delivery robots, guide and explanation robots, and other application-specific robots.**

Delivery Robots

- Mainly used in **restaurants,** or **hospitals, hotels, industrial storages** and other scenarios, which are responsible for delivering items or meals to end consumers.

Cleaning Robots

- Mainly used in building environments such as **office buildings and shopping malls, airports, museums, factory workshops** and so on. These robots are equipped with functions such as sweeping , scrubbing, polishing, vacuuming, and disinfection.

Guide and Explanation Robots

- Mainly used in **office buildings, commercial complexes, exhibition halls, museums,** usually with sound and image interpretation, guidance and other functions.

Other Commercial Service Robots

- **Educational robots, intelligent companion robots, commercial collaborative robots**, etc.

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Source: Frost & Sullivan

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Global Commercial Service Robots Market Analysis

1.2 The Development History and Future Prospect of the Industry

The global commercial service robots industry began in the 1980s. Looking ahead, with the breakthrough advancements in AI and IoT technology, the industry is expected to evolve towards diversified applications and enter a phase of rapid expansion.

- The global commercial service robots industry began in the 1980s and has gone through three distinct stages: **the initial starting stage, the rapid development stage, and the deepening application & industrial upgrading stage.**
- **During the initial starting stage,** countries around the world began to explore robotics technology, gradually deepening their understanding and launching the first-generation commercial service robots products. However, the immaturity of the technology posed a significant obstacle during this phase. As the industry entered **the rapid development stage**, the swift advancements in core technologies such as LiDAR, ultra-wideband (UWB) positioning, computer vision, and simultaneous localization and mapping (SLAM) systems led to the widespread application of commercial service robots in public places such as restaurants, hotels, and shopping malls, resulting in a rapid expansion of the market. Entering into 2020, breakthrough advancements in AI and IoT technology injected unprecedented vitality into service robots, enabling commercial service robots to expand into more fields and ushering the entire industry into **a phase of rapid expansion**.

Industry Development of Commercial Service Robots

Initial starting

Rapid development

Deepening application & industrial upgrading stage

1980s

- **Global -** In the 1980s, robotics technology began to expand into the service robots field, leading to the emergence of initial service robots concepts and prototypes.

1990s

- **Global -** In the 1990s, the exploration of robots on a global scale gradually deepened. In 1996, a team at MIT developed an autonomous mobile robot capable of simple navigation and service in indoor environments.
- **China -** In 1999, the Robotics Institute of Harbin Institute of Technology successfully developed the first autonomous mobile service robot in China, which was used to greet guests and guide visitors, and started China's exploration in the field of commercial service robots.

2000s

- **Global -** At the beginning of the 21st century, governments and enterprises began to pay more attention to the development of robots. In 2008, ECOVACS established and launched the first commercial floor sweeping robots; In 2009, Japan launched the robot "HOSPI" for business greeting, which marked the beginning of the commercial service robots to the market and entered a stage of rapid development.

2010s

- In the 2010s, the rapid progress of robotics technology has accelerated the development of service robots. At this time, commercial service robots have been widely used in public places such as restaurants, hotels, shopping malls, leading to a rapid expansion of the market.
- **Global -** In 2016, Amazon launched the Alexa smart voice assistant and its accompanying devices, further promoting the adoption of commercial service robots.
- **China -** In 2015, Baidu introduced the "Xiaodu" smart robot, equipped with voice interaction and intelligent recommendation functions, accelerating the popularity of intelligent service robots.

- In 2016, Pudu Robotics was established in China and launched its first delivery robot in 2017, quickly gaining recognition in the catering industry, marking the successful commercial application of delivery robots.

Present (2020 - now)

- Since 2020, with the maturity of AI and IoT technologies, the remote control and intelligence level of service robots have improved, market competition has intensified, product types and application scenarios have become more diverse, and the global commercial service robots have entered a stage of deepening application and industrial upgrading.
- **Global -** JAKA Robotics in 2022 launched the JAKA Mini Cobot and JAKA Pro series commercial collaborative robots, targeting emerging application fields such as automotive, electronics, and semiconductors.
- **China -** In 2020, the global promotion of Pudu Robotics' delivery robots entered restaurants and hotels in several countries, demonstrating the competitiveness of Chinese companies in the international market.

Future

- With the continuous progress of technology and the further reduction of costs, service robots are gradually entering more commercial and industrial scenarios.
- At the same time, breakthroughs in core technologies such as AI and IoT have injected unprecedented vitality into service robots, leading the entire industry into a high-speed development channel.

Source: Frost & Sullivan

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Global Commercial Service Robots Market Analysis

1.3 Industrial Value Chain Analysis

The industrial value chain includes suppliers of core components and software in upstream, robot companies in midstream, and various downstream application scenarios, among which robots companies in the midstream occupy a core position in the value chain.

- The commercial service robots industry chain includes: in upstream, core hardware suppliers, such as LiDAR and chips; in midstream, robot companies that focus on the research, development, and manufacturing of core technology systems, which hold a core position in the industry chain and represent the highest value; and downstream application scenarios, such as catering, shopping centers, hotels, and office buildings, etc.

Up-stream

Mid-stream

Down-stream

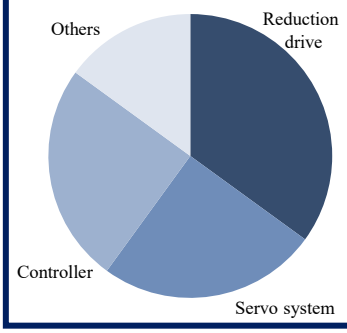
Upstream Core Component Suppliers

LiDAR	Depth Camera	AI Chips	Servo Motor	Controller	Speed Reducers
SLAMTEC 思岚科技	奥比中光 ORBBEC	地平线 Horizon Robotics	YASKAWA 安川電機	ABB	Nabtesco
镭神智能 LeiShen Intelligent System	图漾科技 PERCIPIO.XYZ	intelliFusion 云天励飞	FANUC	KUKA	QCMTT
禾赛科技	INMOTION 乐行	Cambricon 寒武纪	Panasonic	FANUC	
北醒 Benewake					

Upstream Software Suppliers

SLAM Technology	Machine Vision Technology
SLAMTEC 思岚科技 / 速感科技 QFEELTECH	商汤 sensetime / 云从科技
Cloud Service	**Application Development**
Tencent 腾讯 / 阿里巴巴 Alibaba.com	擎朗 KEENON / PUDU
Interaction Technology	**Operating System**
科大讯飞 IFLYTEK / Baidu 百度	图灵机器人 TURING ROBOT / ORIONSTAR 猎户星空

Upstream Cost Structure



Midstream Robotic Companies

Global Positioned Commercial Service Robots Companies*:	Until-Now Local/Regional Market-Focused Commercial Service Robots Companies:
PUDU, Gaussian Robotics 高仙机器人	优必选 UBTECH, ORIONSTAR 猎户星空, 擎朗 KEENON, 优地科技 Excelland AI, ECOVACS, CSJBOT 穿山甲机器人

Note: Global positioned commercial service robots companies refer to those whose overseas revenue accounts for more than 50%.

Downstream Application Scenarios

Mall | Museum | Hotel | Office Building | Catering | Airport | KTV | School | Nursing Home

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Source: Frost & Sullivan

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1.4 Business Model Analysis

The industry primarily operates through three business models: direct sales of complete machines, agent sales, and leasing operations. Each model has its own characteristics and advantages, collectively driving business development and diversifying income for brands.

The global commercial service robots industry primarily adopts three business models: direct sales of complete machines, agent sales, and leasing operations. Each model has its features and advantages, catering to different customer needs. The direct sales model involves selling products directly to end-users, which suits customers with high purchasing power. Through this approach, robot companies can ensure high-profit margins and directly manage customer relationships and brand image. The agent sales model relies on the sales networks and market resources of agents to quickly expand market coverage, reducing sales costs and risks. Agents actively promote products, boosting sales through their efforts. The leasing operation model provides services to customers who are unwilling or unable to pay high upfront costs, reducing initial investment and generating continuous revenue through leasing and maintenance services. This model also enhances customer loyalty and satisfaction. These business models collectively drive the rapid expansion and widespread adoption of the commercial service robots market.

- **Direct Sales of Complete Machines**

Business Model: The direct sales model refers to the approach where commercial service robots companies sell products directly to end users. This model is typically suited for enterprise customers with higher purchasing power, where companies earn profits through direct sales.

Key Characteristics: The main features of the direct sales model include high profit margins, close customer relationships, and strong brand control. Companies can directly interact with customers, understand their needs, provide customized services, and ensuring the quality of both products and services.

- **Agent Sales**

Business Model: The agency sales model involves companies selling commercial service robots to end users through agents. Agents are responsible for sales, marketing, and after-sales services within a specific region or for a particular customer group.

Key Characteristics: The key features of the agency sales model include rapid market expansion through the sales network and market resources of agents, reduced sales and marketing costs, and mitigated market expansion risks. Agents are incentivized by commissions or discounts to actively promote product sales.

- **Leasing Operations**

Business Model: The leasing operations model involves robot companies or specialized leasing companies renting out commercial service robots to customers.

Key Characteristics: The leasing operations model is characterized by lowering the initial investment cost for customers, enabling more businesses to try and use robots. It generates ongoing revenue through leasing fees and maintenance service charges, offers flexibility to accommodate changes in customer needs, and builds long-term relationships to enhance customer loyalty and satisfaction.

Major Business Models of Commercial Service Robots Companies

Types of Business Models	Revenue	Cost of Sales	Customer Initial Investment
Direct Sales of Complete Machines	●	●	◑
Agent Sales	◑	◔	●
Leasing Operations	◔	◑	◔

Note: The "Moon charts" represent the relative size of corresponding indicators. For the three indicators—revenue, cost of sales, and customer initial investment—the full moon, half moon, and quarter moon respectively represent high, medium, and low levels in the comparison.

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Source: Frost & Sullivan

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Global Commercial Service Robots Market Analysis

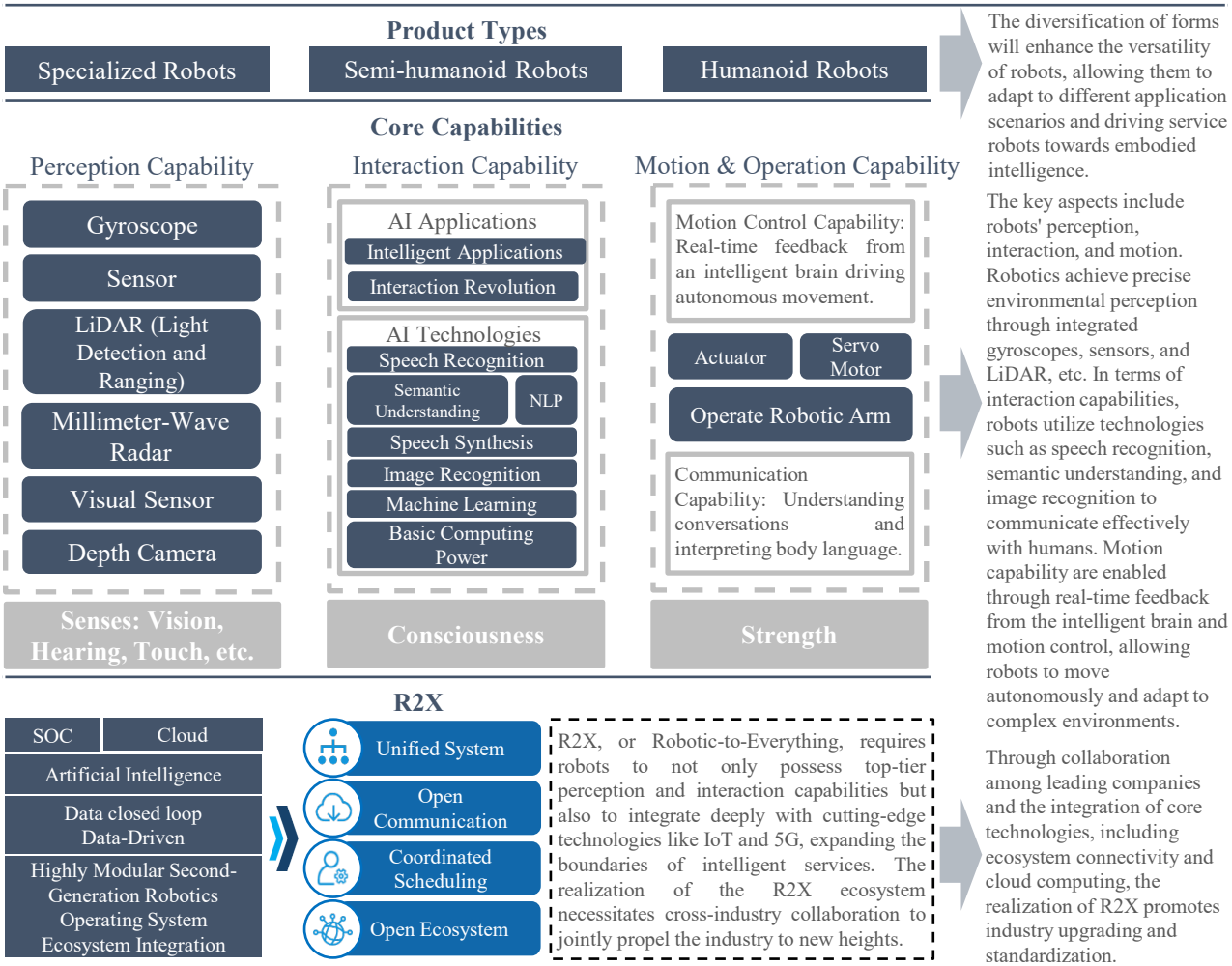
1.5 Key Technologies and Barriers Analysis

The commercial service robots industry is entering a period of accelerated technological innovation and industrial upgrading. Additionally, the leading companies including Pudu Robotics, have begun to collaborate, fostering ecosystem interoperability.

The global commercial service robots industry is entering a phase of accelerated technological innovation and industrial upgrading. The diversified development of key technologies injects continuous vitality and momentum into the industry. These cutting-edge technologies not only lay the foundation for the robots' outstanding performance but also significantly expand their application fields and boundaries, leading the industry to higher levels.

- The development of the global commercial service robots industry relies on key technologies such as perception, interaction, and mobility, which also constitute the technological barriers within the industry. Perception capabilities are achieved through high-precision sensors and cameras, enabling environmental awareness and autonomous navigation. Interaction capabilities depend on natural language processing and voice recognition, allowing robots to understand and respond to users. Advanced drive systems and balance control technologies ensure flexible movement. Additionally, autonomous learning and safety are crucial as well; Robotics continuously adapt to new tasks through machine learning, requiring vast amounts of data and computing power, while ensuring operational safety is paramount. Furthermore, leading commercial service robots companies, including Pudu Robotics, have begun to collaborate to promote ecosystem interoperability. This collaboration aims to achieve R2X, or Robot-to-Everything, driving technological upgrades and standardization within the industry.

Key Technologies and Barriers Analysis in the Commercial Service Robots Field



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Source: Frost & Sullivan

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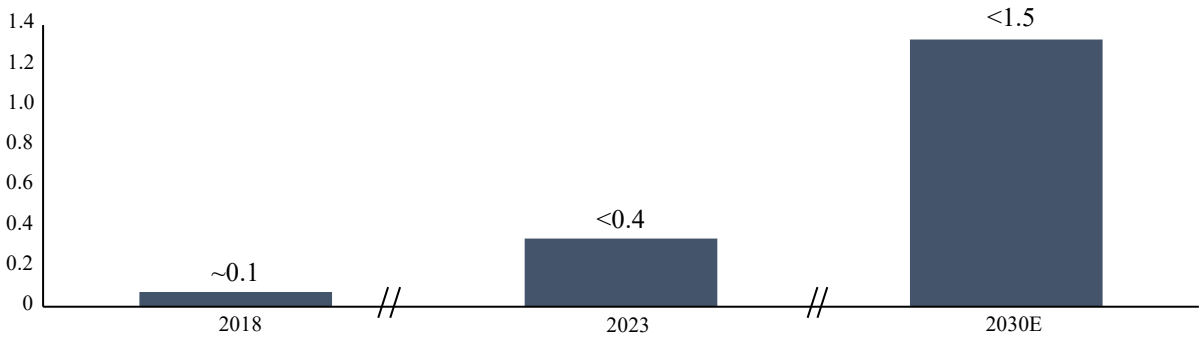
1.6 Analysis of Industry Characteristics in the Global Market

The global commercial service robots market is currently in a phase of rapid development and represents a blue ocean market with a potential nearly USD1.5 billion size by 2023. Key markets with potential demand for commercial service robots products exist across major global regions.

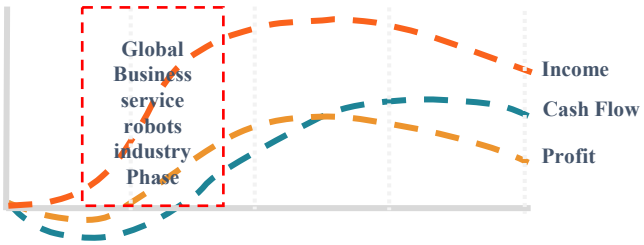
The market demand for commercial service robotics globally shows diverse characteristics, the demand is strong and the market is entering a phase of rapid growth

Commercial Service Robots Market Size (by Revenue), Global, 2018, 2023, & 2030E



From the perspective of the industry lifecycle, the global commercial service robots industry is entering a phase of rapid growth and industrial upgrading, with the substantial market potential expected in the future

Commercial Service Robots Market Lifecycle



- **The global commercial service robots market is currently in an explosive growth phase, with immense potential.** With ongoing advancements in commercial service robots technology and the benefits of technologies such as AI and IoT, it is projected that by 2030, the global business service robots market size will be nearly USD1.5 billion.

Market Drivers and Characteristics of Commercial Service Robots Markets in Global Major Regions

Asia-Pacific Region

- **Drivers**: The Asia-Pacific region is one of the fastest-growing markets for commercial service robots globally. Market growth is primarily driven by an aging population, rising labor costs, and government policy support, particularly in Japan and China, where these factors have significantly increased the demand for commercial service robots.
- **Market Characteristics**: The market characteristics in this region include high technological intensity, diverse application scenarios, and the dominance of local enterprises.

North America Region

- **Drivers**: The North American market is also experiencing considerable growth. High labor costs, technological leadership, and the demand from companies to improve service efficiency are the main drivers of market growth.
- **Market Characteristics**: The North American market is characterized by strong technological innovation capabilities, with service robots having a leading edge in intelligence and automation. The market has a rich variety of application scenarios and is highly concentrated, dominated by large enterprises.

Europe Region

- **Drivers**: The European market is growing slightly slower compared to North America and Asia-Pacific. Market growth is driven by labor shortages, government policy support, and high standards of service demand.
- **Market Characteristics**: The European market is characterized by high demands for product quality and reliability, a focus on the standardization of robotic technology, and international cooperation. Commercial service robots are widely used in healthcare, retail, and public services.

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Source: Frost & Sullivan

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Global Commercial Service Robots Market Analysis

1.7 Current Applications in Key Downstream Sectors

The application of commercial service robots is increasingly widespread across multiple fields, with their high efficiency, low cost, and intelligent features gradually transforming traditional service modes.

Commercial service robots are widely used in scenarios such as catering, hotels, retail, and leisure & entertainment.

- In the **catering** industry, commercial service robots are primarily used for delivery, dish collection, and cleaning. These robots significantly improve delivery efficiency, reduce labor costs, and optimize restaurant operations. Additionally, the introduction of robots enhances the technological appeal and humanized services, improving customer dining experiences, satisfaction, and return rates.
- In the **retail** industry, commercial service robots are employed for cleaning, customer guidance, product promotion, and self-checkout. They provide instant information and assistance, enhance the shopping experience, and attract more customers. Unmanned stores realize 24-hour operations, reducing labor costs.
- In the **hotel** industry, commercial service robots are used for reception, guidance, delivery, and cleaning. They optimize service processes, increase check-in and check-out efficiency, and enhance customer experience.
- In the **leisure & entertainment** industry, commercial service robots are used for customer guidance, interactive entertainment, and information provision. They enhance the technological appeal and interactivity of venues, attracting more customers and increasing traffic and revenue.

Commercial Service Robots are Widely Used in Various Scenarios

Catering
Delivery, dish collection and cleaning

- Improve delivery efficiency, optimize operations, enhance the technological appeal and attract young consumers

Retail
Guidance, product recommendation and self-checkout

- Promote service efficiency, attract customers, enhance shopping experience, enable unmanned retail services

Hotel
Reception, delivery, cleaning and security

- Effectively reduce labor cost, optimize operations and improve efficiency

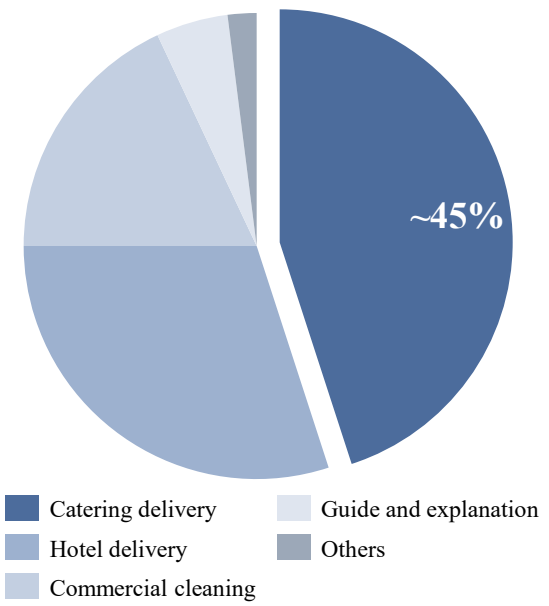
Leisure & entertainment
Self-service ticket purchase, guidance and food&beverage delivery

- Provide personalized services and interactive entertainment

The global commercial service robots market has promising prospects, particularly in the catering industry.

- **Rapidly growing and promising commercial service robots market:** The size of China's commercial service robots market is expected to **reach nearly USD 1.5 billion** by 2030. Leading market participants are actively expanding into global markets, sparking a new wave of commercial service robots applications.
- **Significant empowerment effects of commercial service robots**: Commercial service robots are taking on increasingly important roles in scenarios such as catering and hotels. Leading brands like Pudu Robotics and Yunji Technology effectively enable empowerment through enhancing operational efficiency, optimizing service processes, and improving customer experiences.
- In the global commercial service robots market, **the catering sector holds approximately 45% of the market share**, making it the most outstanding downstream application field, and Pudu Robotics maintains a No.1 position in both China's and Japan's catering sector.

Distribution of Different Downstream Applications in Global Commercial Service Robots Market, 2023



Source: Frost & Sullivan

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1.8 The Empowerment and Value of Commercial Service Robots

Commercial service robots play an increasingly important role in modern service industries. By integrating intelligent and automated technologies into diverse product pipelines, they provide comprehensive support and value in key application scenarios such as hotels, catering, office buildings, and shopping centers.

- **Commercial service robots can perform multiple tasks simultaneously, offering significant support in the primary downstream application scenarios.** In the hotel industry, they provide reception and security management services; in the catering industry, they handle food delivery and cleaning; and in office buildings and shopping centers, they offer greeting and property management services. These robots cover the needs in the pre-, mid- and post-service phases of the industry, enabling standardized and efficient operations.
- In the **hotel** industry, robots effectively reduce labor costs, shorten waiting times, and enhance security management. Specific functions include reception, room service, luggage transport, and security patrols.
- In the **catering** industry, robots improve efficiency through self-service ordering, food delivery and plates collection, maintain consistent service quality, and enhance hygiene management through cleaning and disinfection, optimizing operational processes.
- In **office buildings and shopping centers**, robots perform tasks such as scheduled cleaning, property management, guidance, and security. This improves cleaning efficiency, optimizes property management, and offers diverse customer services, significantly enhancing overall service levels and user experiences.

Empowerment of Commercial Service Robots in Major Application Scenarios

Hotel

Core Pain Points	Empowerment
High labor cost: Reception and room service demand substantial manpower.	**Reception and room service:** Welcome robots can provide reception and room services, reducing labor costs.
Long waiting times: During peak periods, customers face extended wait times for check-in, check-out, and inquiries.	**Check-in/check-out services:** Welcome robots can facilitate self-service check-in and check-out, reducing waiting times and improving efficiency.
Challenging security management: Large hotels encounter significant challenges in maintaining effective security.	**Security management services:** Patrol robots can perform round-the-clock patrols, promptly identifying and alerting to potential safety hazards. In access control management, they can enable intelligent identification, enhancing hotel security management.

Catering

Core pain points	Empowerment
Inefficient ordering and serving: During peak times, slow order taking and food serving can negatively impact the customer experience.	**Self-service ordering and delivery:** Delivery robots can handle both ordering and delivery tasks simultaneously, effectively addressing issues such as incorrect orders and delivery, significantly improving service efficiency.
High employee turnover: The industry faces high staff turnover and instability, frequently resulting in manpower shortages.	**Role-based service:** Delivery robots can perform most tasks in catering, effectively replacing human roles and alleviating the pressure of staff shortages.
Difficult hygiene management: Restaurants have stringent cleanliness requirements, and manual cleaning is often inefficient.	**Cleaning services:** Cleaning robots can effectively assess environmental conditions, promptly clean restaurant floors and tables, and maintain a tidy environment.

Office Buildings and Shopping Centers

Core Pain Points	Empowerment
Low cleaning efficiency: Frequent cleaning requirements with low efficiency from manual labor.	**Scheduled cleaning services:** Cleaning robots can perform cleaning tasks at scheduled times, avoiding disruptions during the peak of working or shopping hours and increasing service efficiency.
Complex property management: Involves multiple tasks such as equipment maintenance and security management, making it challenging to manage.	**Property management services:** Patrol robots can handle daily inspections, equipment monitoring, and security management, significantly enhancing property management capabilities.
Diverse service demand: Various needs such as visitor registration and guidance services create significant pressure on manual service.	**Guide and explanation services:** Greeting robots can manage visitor registration and provide indoor navigation services, improving customer service experience and releasing the pressure on manual staff.

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Source: Frost & Sullivan

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Global Commercial Service Robots Market Analysis

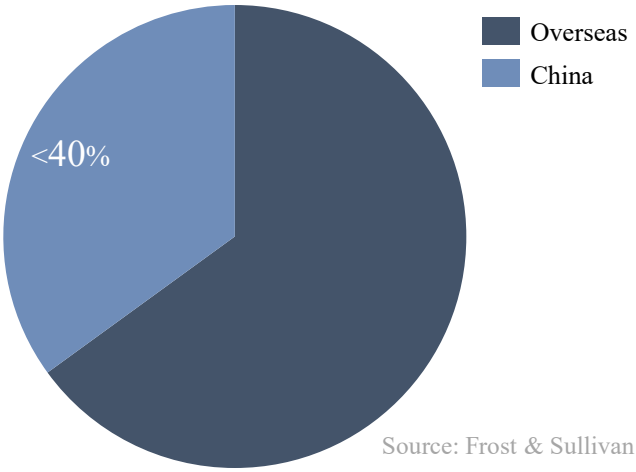
1.9 Global Market Size of Commercial Service Robots

The commercial service robots market is expected to have vast growth potential in the future. Chinese domestic companies, in addition to the large domestic market in China, are also benefiting significantly from the overseas market growth opportunities through their international expansion strategies.

- **The global commercial service robots market is poised to explode.** With the rise of AI technology, the intelligence level of commercial service robots continues to increase. At the same time, technological advancements are making the functions of commercial service robots more comprehensive. In downstream industries such as catering, cleaning, and reception, commercial service robots are taking on more responsibilities. As industrial intelligent transformation and upgrading progress, along with the optimization of industrial structures in China, the demand for commercial service robots will continue to rise, making China an increasingly important part of the global commercial service robots market.
- Driven by technological advancements and market demand, the global commercial service robots market grew from nearly RMB2 billion in 2021 to approximately RMB3 billion in 2023, with a CAGR of 26.1%. **In the future, the global commercial service robots market is expected to expand from around USD0.4 billion in 2024 to nearly USD1.5 billion by 2030, with a CAGR of 20.3%.**

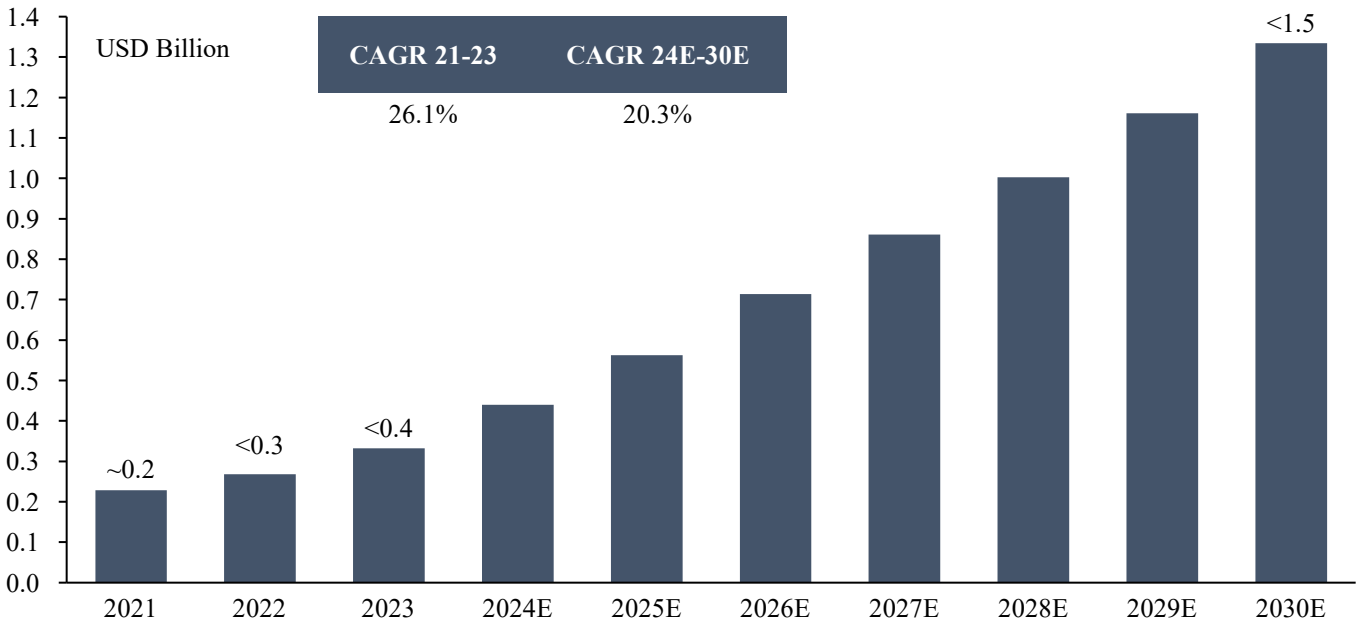
China's commercial service robots market hold a significant position in the global market, **accounting for nearly 40% of the market share in 2023**. It is expected that the share of China's market in the global market will remain stable in the future. Meanwhile, companies such as Pudu Robotics have successfully expanded overseas, opening up broader growth opportunities.

China's Commercial Service Robots Market Share in the Global Market , 2023



Source: Frost & Sullivan

Market Size of Global Commercial Service Robots (by Revenue), 2021-2030E



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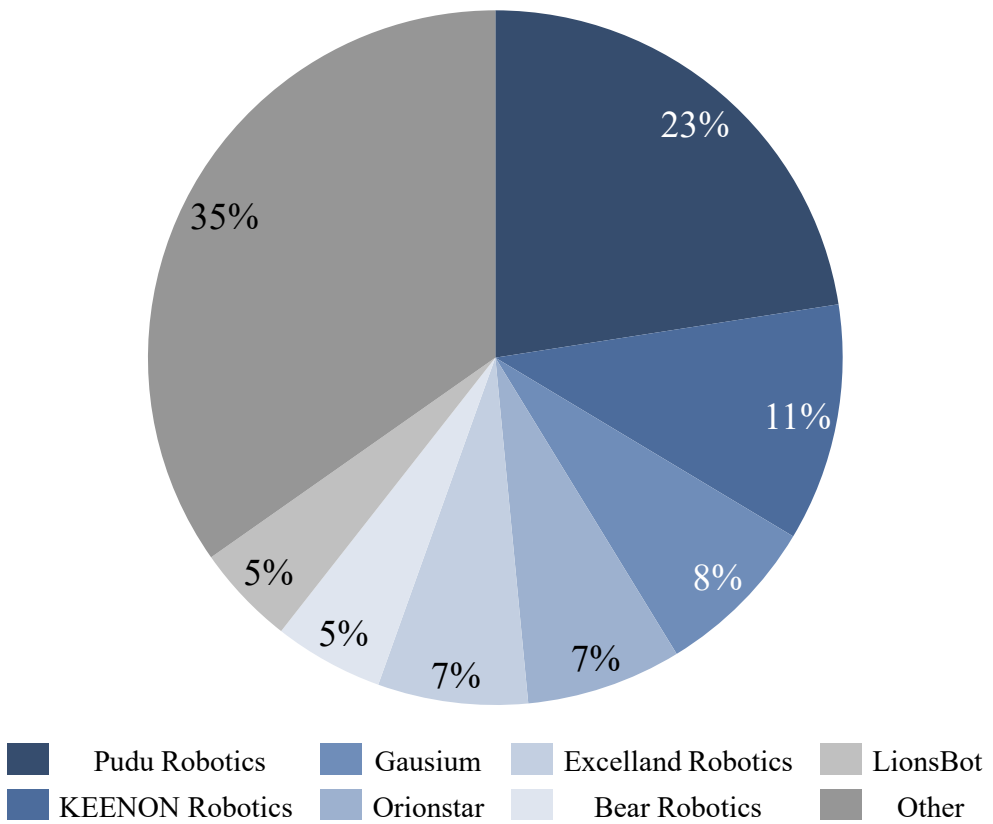
Source: Frost & Sullivan

1.10 Market Share Analysis of Global and Chinese Leading Companies (1/2)

The leading companies in the global commercial service robots market have significant competitive advantages, gradually creating a "Matthew Effect." Pudu Robotics ranked the first in both the global and Chinese markets, securing a leading position in the industry.

- The leading companies in the global commercial service robots market have significant competitive advantages, gradually exhibiting the "Matthew Effect." The ongoing technological advancements, coupled with the increasing demand for intelligent transformation across various industries, have driven rapid growth in the commercial service robots sector. In 2023, Chinese commercial service robots companies accounted for more than half of the global revenue. However, globally, there are other key players such as Bear Robotics and Lionsbot. **Based on 2023 revenue, Pudu Robotics ranked the first in the global commercial service robots market, showing a leading position.**
- **The global commercial service robots market is characterized by a strong concentration of leading companies. Notably, all of the top five companies are Chinese companies, collectively accounting for more than half of the global market. Among them, Pudu Robotics firmly hold the leading position with a market share of 23%.**

Market Share of Commercial Service Robots Companies in the Global Market, by Revenue, 2023



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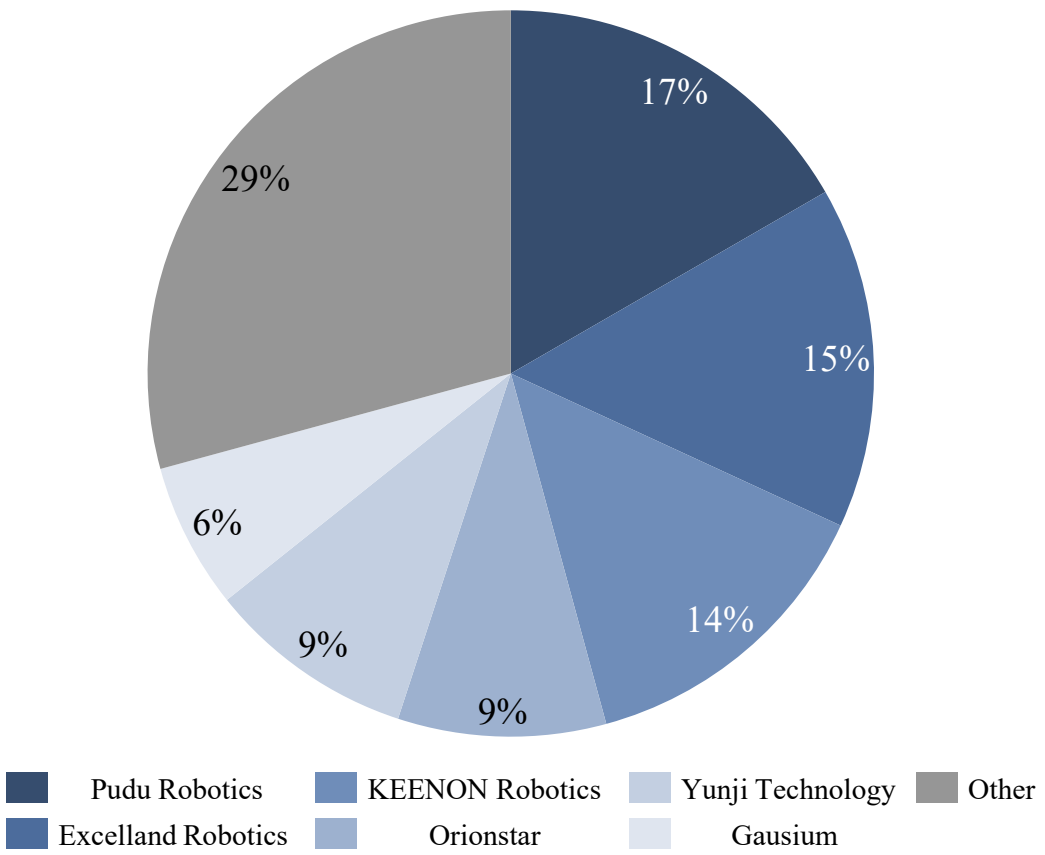
Source: Frost & Sullivan

1.10 Market Share Analysis of Global and Chinese Leading Companies (2/2)

The leading companies in the global commercial service robots market have significant competitive advantages, gradually creating a "Matthew Effect." Pudu Robotics ranked the first in both the global and Chinese markets, securing a leading position in the industry.

- As one of the world's largest robots markets, China's commercial service robots industry has developed rapidly in recent years driven by policy support and strong market demand. This dynamic environment has given rise to internationally competitive companies such as Pudu Robotics, Orionstar, Yunji Technology, and Keenon Robotics. **Based on the revenue in 2023, Pudu Robotics ranked the first in the China's commercial service robots market, showing a leading position.**
- **China's commercial service robots market is highly consolidated, with the top three companies accounting for nearly half of the market. Among them, Pudu Robotics has firmly established itself as the market leader in the China, with a market share of 17%.**

Market Share of Commercial Service Robots Companies in China Market, by Revenue, 2023



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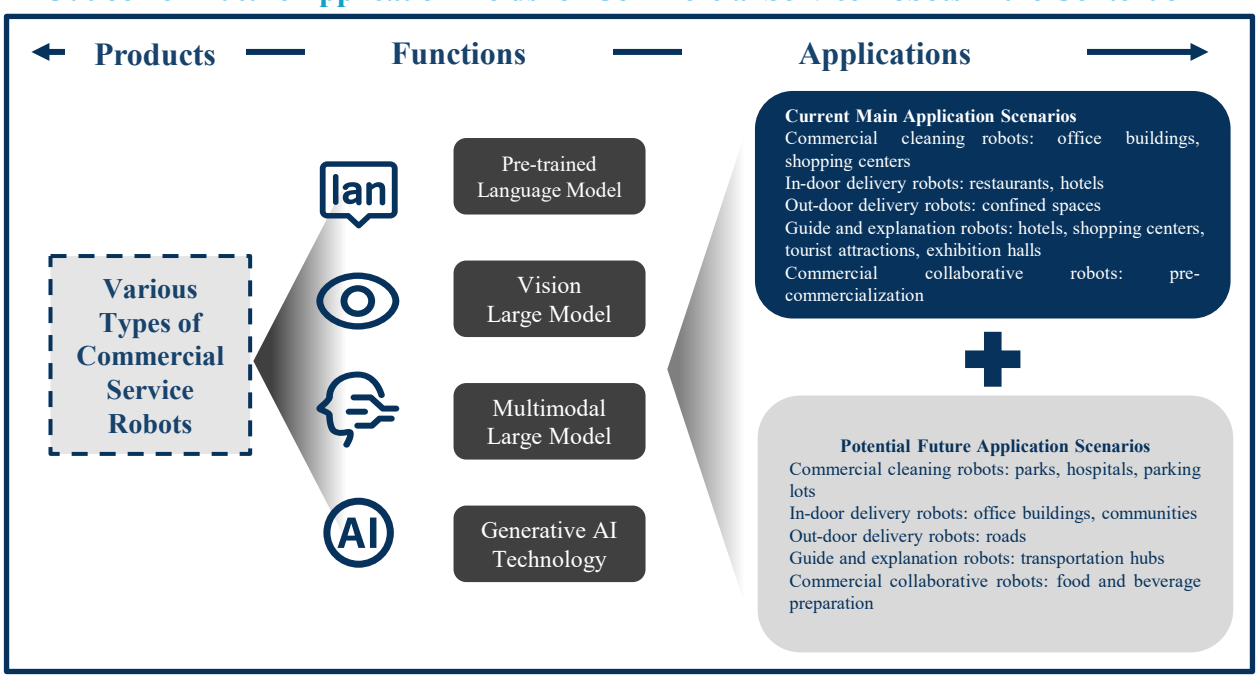
Source: Frost & Sullivan

1.11 Prospects for Future Application Fields of Commercial Service Robots

In the macro context of AI+, the integration of AI technology is pushing the capabilities of commercial service robots to unprecedented heights. This technological integration not only enhances the intelligence of robots but also significantly expands their application fields, opening up diverse possibilities for the future of robotics technology in various scenarios.

- **The integration of large models of AI will drive robotics technology toward a higher level of intelligence.** By deeply integrating across key areas such as voice recognition, visual processing, decision support, and motion control, robots will be able to establish a complete perception-decision-execution loop. This loop will not only greatly enhance the interactive capabilities of robots but also significantly improve their autonomy and adaptability, leading to a qualitative leap in the "intelligence" of robots within the smart technology domain.
- **The integration of AI technology has significantly expanded the capabilities of commercial service robots.** Pre-trained language models enable robots to understand and generate natural language, enhancing the intelligence of human-robot interactions. Visual large models are used for image recognition and processing, improving the robots' ability to perceive their environment. Multi-modal models combine data from various sensory inputs, boosting the robots' overall judgment and decision-making abilities. Generative AI technology is employed for creative tasks such as content generation and complex problem-solving.
- **The enhancement in functionality has directly driven the expansion of the product matrix for commercial service robots and broadened their application scenarios.** Currently, commercial cleaning robots are primarily used in office buildings and shopping centers, indoor delivery robots are widely utilized in restaurants and hotels, outdoor delivery robots handle deliveries within enclosed campuses, and guidance robots serve in hotels, shopping malls, tourist attractions, and exhibition halls. Commercial manufacturing robots play a role on production lines in large factories. As the AI technology continues to advance, these robots are expected to expand into even more application scenarios in the future. Commercial cleaning robots will be deployed in a wider range of public spaces, such as parks, squares, hospitals, and parking lots; indoor delivery robots will become more common in office buildings and residential communities; outdoor delivery robots will expand into more open environments like public roads; guidance robots will offer more convenient services in transportation hubs; Commercial collaborative robots will enter complex production scenarios like food and beverage preparation.

Outlook on Future Application Fields for Commercial Service Robots in the Context of AI+



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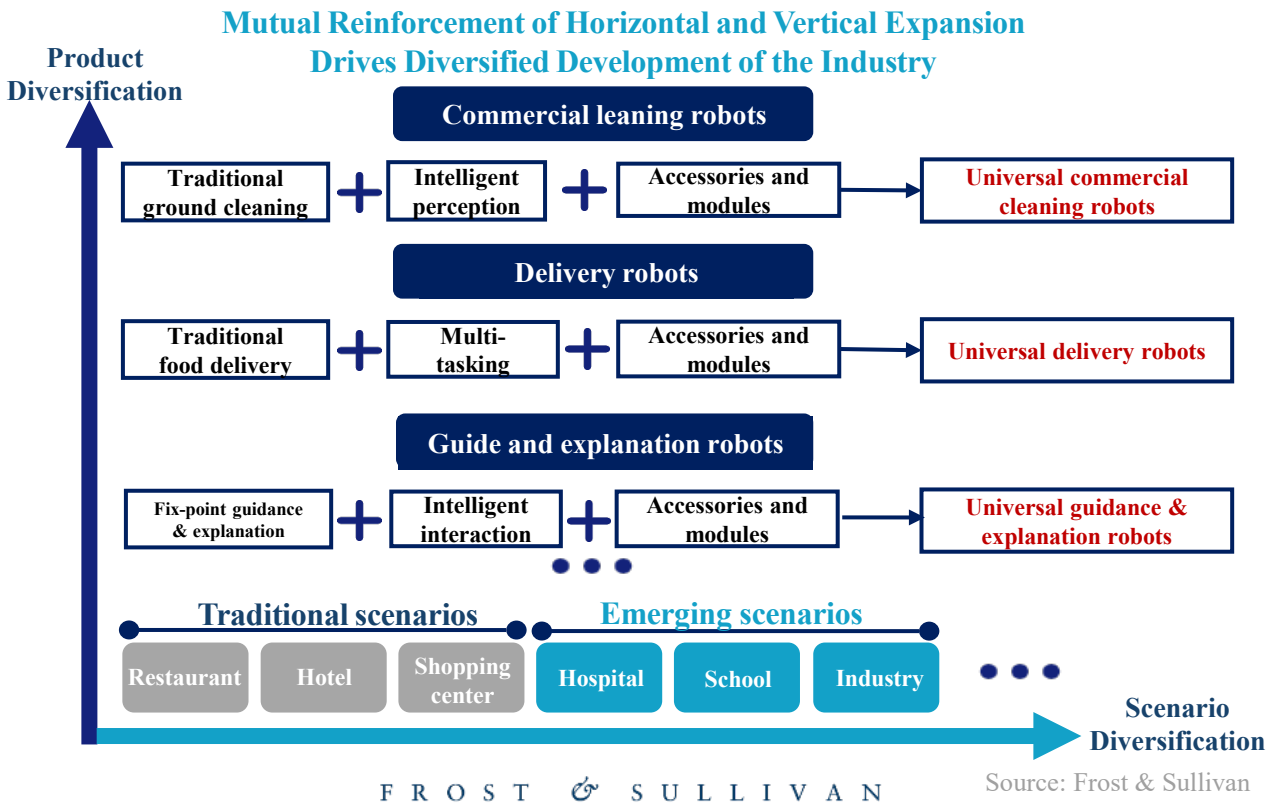
Source: Frost & Sullivan

1.12 Diversification Trends (1/2): Expansion Prospects of Products & Application Scenarios

Global leading companies, represented by Pudu Robotics, are vertically enriching their product offerings to enhance adaptability and functional diversity. Horizontally, they are continuously exploring the possibilities of implementation across multiple industries and scenarios.

- Currently, the development focus for commercial service robots is on indoor low-speed autonomous driving technology, supplemented by the addition of extra functional modules to meet the demands of various scenarios. Most companies have adopted a development path that involves first deeply addressing the core needs of a single scenario, and then expanding into other application areas. This approach involves accurately identifying customer needs, developing targeted functional products, and subsequently integrating multiple functions to create higher value for various commercial service scenarios. In the future, leading global commercial service robots companies will continue to diversify, primarily in two dimensions: **horizontal expansion across scenarios and vertical extension of product matrix.**
- **Horizontal expansion in scenarios:** With continuous technological advancements and cost reductions, robots will not be limited to current basic functions like delivery, cleaning, and guidance. Instead, they will play a role in more emerging fields, such as smart retail, personalized healthcare, intelligent education, and advanced manufacturing. The integration of artificial intelligence and IoT technologies, in particular, will enable robots to better understand and adapt to different work environments, providing more efficient and customized services, thereby further enhancing operational efficiency and customer experience across various industries.
- **Vertical extension in product matrix:** In the trend of diversified development, commercial service robots companies will continually expand their product matrices to meet market demands. This includes integrating multiple functions such as delivery, cleaning, guidance, monitoring, and interaction, transforming products into **highly integrated intelligent devices**. Companies will focus on developing multifunctional robots capable of meeting diverse scenarios and complex needs, providing more flexible and efficient services. Through modular design and software upgrades, they will continuously enhance robots performance and expand application areas, thereby maintaining a leading position in the competitive market.
- Looking ahead, the commercial service robots industry will be continuously empowered by the mutual reinforcement of horizontal application diversification and vertical product variety. The industry will move towards **greater efficiency, intelligence, and flexibility**.



Source: Frost & Sullivan

Section One

Global Commercial Service Robots Market Analysis

1.12 Diversification Trends (2/2): Benchmarking the Diversification Process of Leading Companies

Leading domestic companies are gradually building exceptional brand strength and leadership in the global market through a relatively comprehensive product matrix, independently controlled core technologies, and close collaboration with downstream customers.

		PUDU	ORIONSTAR 猎户星空	擎朗 KEENON
Product Matrix	Delivery	● PuduBot, BellaBot, PUDU HolaBot, FlashBot, PUDU SwiftBot, PuduBot2, BellaBot Pro,E etc.	● LuckiBot Series Products	● T3 、 T8 、 T9 、 T10
	Cleaning	● PUDU SH1, PUDU CC1, etc.	● Disinfected Bot Product	● C30
	Guidance	● KettyBot, KettyBot Pro, etc.	● GreetingBot Series Products	● W3
	Other	● PUDU T300, etc.	● Zhicha Master, etc.	● X101、M104、M2、X202、M101、S100
Product Performance		PuduBot 2: 3D obstacle avoidance, V-SLAM positioning and navigation BellaBot: infrared tray sensor, modular quick-release structure PUDU CC1: 15L clean water tank and 15L dirty water tank, automatic water refill and discharge	LuckiBot Pro: Food recognition camera, 360° intelligent ambient light, 240° LiDAR, three RGB-D cameras, etc. Orion Star's self-developed voice interaction system has full-link far-field voice technology and a rich audio content matrix	DINERBOT T10: autonomous navigation, high load capacity, intelligent obstacle avoidance system, and 8 hours of battery life Independent suspension chassis, multi-link damping system, coaxial linkage suspension based on CAE simulation It has a large load capacity of 40KG and can pass through a narrow road of 59CM flexibly
Technical advantages		✓ Self-developed PUDU VSLAM+ technology, dynamic perception algorithm, and advantages in positioning, perception, planning, scheduling, and control.	✓ AI-based intelligent hardware and software integration technology	✓ Focused on automatic navigation and path planning technology, with high-precision sensors and algorithm optimization
Strategic Cooperation		✓ 40,000+ end users; cooperated with well-known companies in many fields such as Panasonic and Haidilao	✓ Cooperated with large technology companies such as JD.com and Baidu	✓ Cooperated with famous hotel brands such as Marriott and InterContinental
Globalization process		✓ In 2023, overseas revenue accounted for more than 60%, with the highest market share in Japan.	✓ In 2023, overseas revenue accounted for less than 50%.	✓ In 2023, overseas revenue accounted for less than 50%.

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Source: Frost & Sullivan

Section Two

Global Expansion Trends of Chinese Commercial Service Robots Companies

2.1 Localization Adaptability Analysis of Chinese Companies' Products and Service

Chinese commercial service robots companies need to enhance their adaptability in areas such as language and culture, regulations, and localized services to successfully enter global markets. However, leading companies have already made significant progress in this process.

Analysis of the Localization Adaptability Dimensions for Chinese Commercial Service Robots Companies in Global Markets

Core Evaluation Dimensions	Representative Industry Practice Cases
A. Language And Cultural Adaptability ■ In order to successfully enter international markets, Chinese commercial service robots companies prioritize multilingual support, ensuring that their products meet the language requirements of different countries and regions. By integrating advanced speech recognition and natural language processing technologies, they provide seamless multilingual communication capabilities, thereby enhancing the global user experience. ■ Different markets have unique cultural habits and user expectations, requiring customized product designs and features to address these differences. Companies are gradually adapting to these cultural differences by offering customized interfaces and interaction designs to meet the needs of users in various regions.	**PUDU BellaBot** ✓ Adopts a cat ear design for the head, catering to the "kawaii" culture of the Japanese market, along with custom cherry blossom and kimono-themed skins. ✓ Enhances the consumer experience with robot services. 
B. Regulatory And Product Certification ■ Chinese companies are increasingly focusing on obtaining various international certifications. ■ Chinese companies have a thorough understanding of and compliance with local laws and regulations when entering these markets.	**Orionstar** ✓ Obtained ISO 9001 Quality Management System Certification and ISO/IEC 27001 Information Security Management Certification, ensuring that its products meet international standards in terms of quality and safety. 
C. Localization Service ■ Chinese companies are gradually establishing offices and service centers in major global markets, providing localized technical support and after-sales services. These centers are not only responsible for the maintenance and repair of products but also offer customer training and technical consultation to ensure the efficient operation of robots in local settings. ■ Through collaboration with local companies, Chinese companies can better understand and meet the needs of local markets, facilitating rapid entry into new markets. Additionally, by leveraging the resources and networks of their partners, they can enhance product market acceptance and user satisfaction.	✓ Pudu Robotics has established hundreds of service centers worldwide, with operations spanning over 60 countries and regions, covering more than 600 cities. 

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Source: Frost & Sullivan

2.2 Policy Environment for Chinese Commercial Service Robots Companies' Global Expansion (1/2)

The Chinese government has shown considerable attention to the global expansion of the commercial service robots industry and has continuously introduced favorable policies, reflecting its emphasis on and support for strategic emerging industries.

- The Chinese commercial service robots industry is steadily advancing onto the international stage, with the construction of an international trade policy framework for global expansion reflecting the nation's emphasis on and support for this strategic emerging industry. In recent years, particularly with the rapid development of the global commercial service robots market and the growing demand from overseas, the Chinese government has introduced a series of policies aimed at promoting the internationalization of commercial service robots, injecting strong momentum into the industry's global journey.
- China's robots industry is advancing its internationalization at an unprecedented pace, with commercial service robots leading the way as a frontrunner in achieving commercial success. Leveraging the rich practical experience accumulated from navigating complex and varied domestic application scenarios, Chinese commercial service robots companies are accurately targeting markets with strong global demand and actively building diversified collaborative ecosystems.

Core guidelines: Support domestic commercial service robots companies, promote internationalization and localization, and accelerate domestic substitution and brand emergence in the global market.

Policy Guidance

Since 2006, the Chinese government has promulgated a series of support policies at all levels to promote the prosperity and development of the robots industry. These policies provide clear guidance and a solid support foundation for the overseas expansion of robotics technology. At present, the main regulations and related policies formulated for this industry are as follows:

Policy Name	Year of Promulgation	Issuer	Policy Highlights
"Robotic+" Application Action Implementation Plan 《「机器人+」应用行动实施方案》	2023	17 departments including the Ministry of Industry and Information Technology	Deepen cooperation and exchanges with international partners in robotics technology, standard setting, intellectual property protection, etc., and jointly promote the establishment and popularization of international standards for commercial service robots. By widely promoting the application of robots in various industries, significantly enhance the visibility and recognition of Chinese commercial service robots in the global market. At the same time, actively encourage and support domestic commercial service robots companies to bravely participate in international market competition, actively explore overseas markets, and steadily expand their international market share.
Beijing Robotics Industry Innovation and Development Action Plan (2023-2025) 《北京市机器人产业创新发展行动方案(2023—2025年)》	2023	Beijing Municipal People's Government Office	Beijing's service robots companies are encouraged to actively explore the international market and use international exhibitions, market promotion and other diversified means to enhance the influence of international brands. The government will set up a special fund to help companies implement overseas mergers and acquisitions strategies, establish R&D and production bases, and accelerate the internationalization process of companies. In addition, it also promotes companies to deeply participate in the formulation and application of international standards to ensure that products successfully cross the threshold of international market access.
Shenzhen City Action Plan for Cultivating and Developing Intelligent Robotics Industry Clusters (2022-2025) 《深圳市培育发展智能机器人产业集群行动计划(2022-2025年)》	2022	Shenzhen Municipal Bureau of Industry and Information Technology, etc.	Support Shenzhen intelligent robot enterprises to enhance their comprehensive competitiveness in the global market through technological innovation and international cooperation. By providing export subsidies, tax exemptions and special fund support, help enterprises expand overseas markets, actively participate in international exhibitions, and strengthen market promotion. At the same time, encourage enterprises to establish cooperative relations with world-renowned institutions, introduce cutting-edge technologies, and further consolidate and enhance their competitive advantages in the international market.

Source: Frost & Sullivan

2.2 Policy Environment for Chinese Commercial Service Robots Companies' Global Expansion (2/2)

Policy Name	Year of Promulgation	Issuer	Policy Highlights
"14th Five-Year Plan" Robotics Industry Development Plan《"十四五"机器人产业发展规划》	2021	Ministry of Industry and Information Technology and other 15 departments	By strengthening the industry's innovation capabilities and high-end product supply capabilities, a solid foundation will be laid for China's commercial service robots to go global. The plan encourages companies to actively participate in international competition, deepen international cooperation, and promote the widespread application of Chinese commercial service robots around the world. At the same time, a series of fiscal and taxation financial support policies will be implemented to help companies expand overseas markets and enhance international competitiveness.
Implementation Opinions on Promoting Innovation and Development of Foreign Trade《关于推进对外贸易创新发展的实施意见》	2020	Office of the State Council	Improve the competitiveness of commercial service robots in the international market by enhancing their technical content and added value. Encourage enterprises to use emerging channels such as modern information technology and e-commerce platforms to strengthen the international market promotion and sales of commercial service robots. At the same time, support enterprises to strengthen brand building, cultivate leading enterprises with international competitiveness, and promote the commercial service robots industry to a higher quality international development.
Three-Year Action Plan for Promoting the Development of the New Generation of Artificial Intelligence Industry (2018-2020)《促进新一代人工智能产业发展三年行动计划(2018-2020 年)》	2017	Ministry of Industry and Information Technology	Encourage the international application of artificial intelligence technology and related service robots products, and support enterprises to seize the international market opportunities by relying on technology exports. At the same time, promote enterprises to actively participate in international cooperation, improve their technical level, and ensure that their products pass international authoritative certification, so as to occupy a more advantageous position in the global market.
Robotics Industry Development Plan (2016-2020)《机器人产业发展规划(2016-2020)》	2016	Ministry of Industry and Information Technology, National Development and Reform Commission, Ministry of Finance, etc.	We encourage robot enterprises to "go global" and actively expand their international market presence through export trade, international cooperation, overseas mergers and acquisitions, etc. At the same time, we promote robot products to fully comply with international standards, effectively reduce barriers to international market access, and pave the way for the rapid development of Chinese robot enterprises in the global market.
"Outline of the National Medium- and Long-Term Science and Technology Development Plan (2006-2020)"《国家中长期科学和技术发展规划纲要(2006-2020 年)》	2006	State Council	Support high-tech enterprises (including service robots enterprises) to actively participate in international competition and vigorously expand overseas markets by relying on scientific and technological innovation and technology exports. Encourage enterprises to continuously enhance their brand influence and comprehensive competitiveness in the global market through international cooperation and brand building.

Source: Frost & Sullivan

Section Two

Global Expansion Trends of Chinese Commercial Service Robots Companies

2.3 Analysis of Entry Modes and Advantages/Disadvantages for Chinese Companies

Chinese commercial service robots companies have demonstrated diversified market entry strategies in the process of expanding into global markets, flexibly adapting to the unique market demands and business environments of different countries and regions.

Analysis of the Core Advantages and Potential Challenges of Chinese Commercial Service Robots Companies' Global Expansion Strategies

	Core Advantages	Potential Challenges
Direct Export	■ **Cost Control**: Companies can maintain control over domestic production processes and leverage domestic cost advantages to reduce product costs. ■ **Direct Market Feedback**: Direct interaction with end customers allows for quick acquisition of market feedback and adjustment of product strategies.	■ **High Market Risk**: Facing overseas markets directly involves higher market risks, such as exchange rate fluctuations and changes in trade policies. ■ **Channel Limitations**: A lack of local sales channels and after-sales service systems may impact the speed of market expansion and customer satisfaction.
Partnership	■ **Fast Market Entry**: By partnering with local partners, companies can quickly enter the market and leverage the partner's resources and channel advantages. ■ **Risk Reduction**: Partners usually have a deeper understanding of the local market, which helps to reduce market risks. ■ **Localized Services**: Partners can provide product customization and after-sales services that are more aligned with the local market.	■ **Profit Sharing**: Profits need to be shared with partners, which may affect the overall profitability of the company. ■ **Weakened Control**: During the collaboration process, the company's control might be limited, affecting the flexibility of strategic decision-making. ■ **Partnership Risks**: There are risks associated with choosing and managing partners, such as partner defaults or poor management.
Establishing Branches	■ **In-Depth Market Understanding**: Establishing branches allows for a deeper understanding of the local market and enables customization of products and marketing strategies based on market demand. ■ **Localized Operations**: Branches can establish local teams to provide products and services that are more tailored to the local market. ■ **Brand Building**: Branches help with better brand promotion and publicity, enhancing brand awareness and reputation.	■ **High Investment**: Setting up branches requires significant initial investment, including costs for personnel, facilities, equipment, etc. ■ **Management Difficulty**: Cross-border management presents challenges and requires the establishment of a comprehensive management system and communication mechanisms.

Direct Export

- Suitable for companies testing the waters in overseas markets or engaging in small-scale exports, allowing for quick market response evaluation and strategy adjustment.

Partnership

- This model is ideal for companies looking to enter the market quickly and requiring localized services, but attention should be paid to managing partnership risks.

Establishing Branches

- Best suited for companies with long-term plans for overseas markets and strong financial resources, enabling deeper market penetration and brand building.

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Source: Frost & Sullivan

Section Two

Global Expansion Trends of Chinese Commercial Service Robots Companies

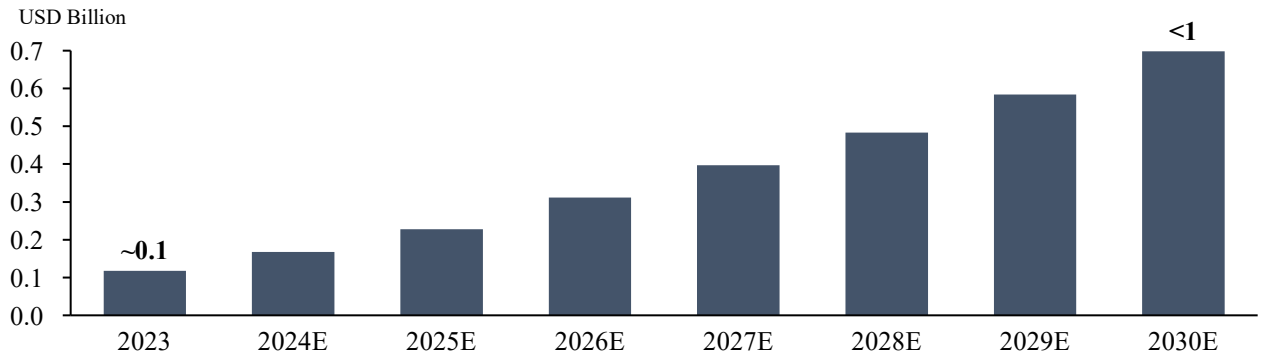
2.4 Market Potential for Chinese Companies' Global Expansion

The global expansion prospects for Chinese commercial service robots are highly promising, with a large untapped market for exploration. Leading companies, such as Pudu Robotics, have successfully entered the global market and have already achieved significant success.

Outlook for the Global Expansion of Chinese Commercial Service Robots

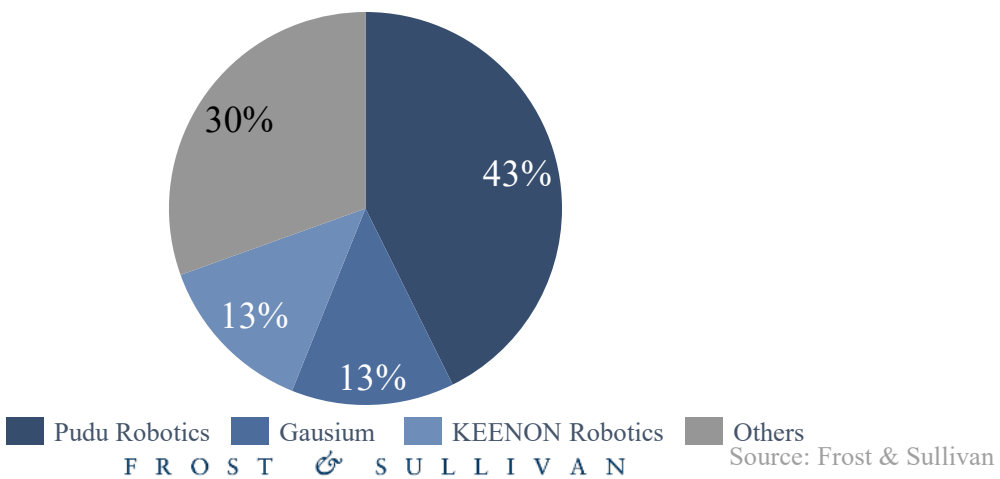
- With the rapid advancement of artificial intelligence and robotics technology, China's service robots are gradually taking on a significant role in the global market. Chinese companies, leveraging their advantages in manufacturing costs, technological innovation, and supply chain management, are able to provide cost-effective and multifunctional service robots products that meet the diverse needs of various markets worldwide. **As international demand for intelligence and automation continues to grow, the global expansion of Chinese commercial service robots will face greater opportunities, with the potential for even greater success on the global stage in the future.**
- The market share of Chinese commercial service robot enterprises in overseas markets has experienced significant growth over the past few years, increasing from around USD70 million in 2021 to approximately USD0.1 billion in 2023. By 2030, it is expected that the market size will reach nearly USD1 billion, providing a solid demand-side foundation for the global expansion of Chinese commercial service robots companies.

Market Size of Commercial Service Robots' Global Expansion (by Revenue), 2023 - 2030E



- **Several leading Chinese commercial service robots companies have already initiated their global expansion strategies, with Pudu Robotics showing a leading position in overseas market with a market share of 43%.**

Market Share of Chinese Commercial Service Robots Companies, by Revenue from Overseas Market, 2023



Source: Frost & Sullivan

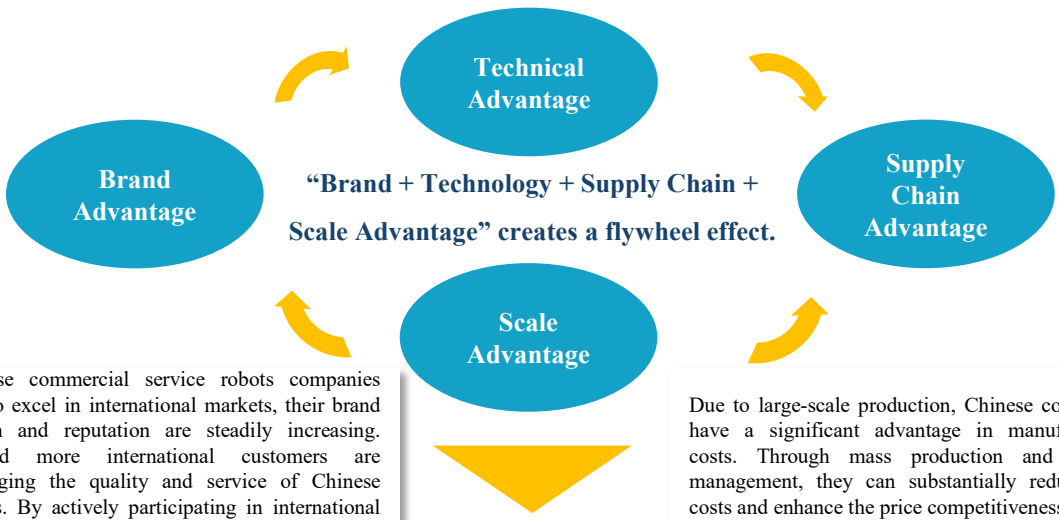
2.5 Analysis of Advantages of Chinese Companies' Global Expansion Strategies

Chinese companies, by capitalizing on advanced technology, robust supply chains, industry scale advantages, and growing brand influence, are gradually creating a flywheel effect. These efforts have enabled them to secure a strong position in the international market and achieve sustainable growth.

- Chinese commercial service robots companies, by leveraging advanced technology, robust supply chains, large-scale production, and growing brand influence, have built strong momentum. This momentum has secured a competitive edge in the global market, driving sustainable growth and enhancing their leadership position internationally.

Chinese companies have invested heavily in research and development, accumulating extensive experience and technical patents. The rapid advancements in artificial intelligence, sensor technology, and automation control have enabled Chinese companies to launch high-performance products that are internationally competitive. Through continuous R&D investment and technological innovation, these companies have developed robots with leading functionality, stability, and intelligence. For example, many companies have already integrated advanced features such as voice recognition, visual navigation, autonomous learning, and environmental perception, significantly enhancing the adaptability of robots in various complex environments.

China possesses the most comprehensive manufacturing supply chain system in the world, providing efficient and reliable support from upstream component supply to downstream assembly of complete machines, ensuring product quality and production efficiency. This robust supply chain network enables Chinese companies to respond swiftly to market changes, flexibly adjust production plans, and meet the personalized needs of customers. The well-established supply chain also includes in-house production capabilities for key components, reducing dependence on external suppliers and enhancing the stability and security of the supply chain.



As Chinese commercial service robots companies continue to excel in international markets, their brand recognition and reputation are steadily increasing. More and more international customers are acknowledging the quality and service of Chinese Companies. By actively participating in international exhibitions and conducting global marketing campaigns, these companies are expanding their brand influence worldwide. A strong brand image not only helps companies gain more customer trust but also lays the foundation for entering additional markets.

Due to large-scale production, Chinese companies have a significant advantage in manufacturing costs. Through mass production and refined management, they can substantially reduce unit costs and enhance the price competitiveness of their products. The economies of scale achieved through large-scale production enable Chinese companies to offer high-quality products at more competitive prices while maintaining quality standards.

Advanced product technology enhances a company's market competitiveness and drives efficient supply chain operations. A well-established supply chain system and the advantages of industrial scale enable companies to offer high-quality products at competitive prices, further boosting brand influence and market recognition. As brand influence grows, companies can attract more resources and market opportunities, further driving technological innovation and supply chain optimization, creating a self-reinforcing cycle that ultimately leads to sustained success in the Global market.

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Source: Frost & Sullivan

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