



GLOBAL EQUITY | MARCH 2023

# Technology, Media, and Telecommunications Subsector Primer

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## I. Consumer Robotics

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## Consumer Robotics

### Co-Existing with Robots

March 2023

*The value proposition of consumer robots lies in their ability to support or completely automate physically demanding tasks in everyday life including cleaning, cooking, entertainment, personal assistance, and security. The consumer robotics industry is rapidly evolving, with advancements in technology and changing consumer demands driving growth and innovations.*

#### Industry Overview

The consumer robotics industry is an exciting and growing space. It has many verticals based on application such as household robots, entertainment, medical assistance, personal cognitive care, and companionship. Cleaning robots currently hold the largest market share in the consumer robotics industry with a revenue share of 42% in 2021.

#### Industry Drivers

The industry is mainly driven by the increasing demand for automation and convenience in everyday life. That demand has been accelerated due to several factors including smart home technology, artificial intelligence, COVID-19, and robotic automation processes. However, the industry is faced with the headwind of high costs leading to potential low adoption rates and difficult hurdles to overcome.

Industry Research	
Global Revenue	\$500.0B
Annual Growth (Past 5 Years)	5.0%
Annual Growth (Next 5 Years)	5.0%
Key Companies	
<b>iRobot</b>	NASDAQ: IRBT
Enterprise Value	\$1.1B
LTM EV/EBITDA	nmf
<b>KingClean Electric</b>	SHA: 603355
Enterprise Value	\$2.3B
LTM EV/EBITDA	22.3x
<b>Omron Corporation</b>	TYO: 6645
Enterprise Value	\$10.5B
LTM EV/EBITDA	11.6x
<b>Ecovacs Robotics</b>	SHA: 603486
Enterprise Value	\$6.5B
LTM EV/EBITDA	22.4x
<b>Xiaomi Corporation</b>	HKG: 1810
Enterprise Value	\$29.0B
LTM EV/EBITDA	23.1x
Industry Financial Forecast	

## Overview on Consumer Robotics

### The Ecosystem

Consumer Robotics are developed for use by the general public where the fundamental goal of these robots is to make people’s life easier. The specific functions of these robots come in all forms and tasks such as surveillance, security, personal, education, or home duties such as vacuuming, floor mopping, window washing, pool washing, and other household tasks. Most Consumer Robots are simplistic, but some can have integrated capabilities and can be highly autonomous.

The release of the first Roomba Vacuum in 2002 marked a revolution as it was the first successful domestic robot in the world, but what was once ground-breaking is now becoming increasingly common. Over the past two decades, we have seen the Consumer Robots market take off due largely to changing consumer preferences and technological advances, among other factors. For example, as of a 2016 report, the percentage of vacuum cleaners that were robots was 20% and increasing. Today, we are seeing greater adoption of Consumer Robotics amidst the emergence of new technologies, changing consumer preferences, and a broader social acceptance of autonomous machines.

We have divided the Consumer Robotics ecosystem into several main verticals based on functionality. First, household robots, broadly encompasses home duties such as vacuum and mopping, lawn mowing, companionship, and other similar applications. Household robots is a type of service robot that is used for household chores. Other functionalities include entertainment, medical assistance, personal cognitive care, and companionship. The global consumer robotics market was valued at US \$17770 million in 2019 and is expected to reach US \$76390 million by the end of 2026, growing at a CAGR of 22.9% during 2021-2026.

**Exhibit #1 High Level View of Consumer Robotics Landscape**



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## Drivers

The consumer robot industry is being driven by several factors that are contributing to its growth and development. One of the main drivers is the increasing demand for automation and convenience in everyday life. Consumers are looking for ways to simplify their lives and make tasks easier, and robots are seen as a key solution to achieving this. Robots are being developed and marketed for a wide range of applications, including cleaning, cooking, entertainment, personal assistance, and security.

### **Smart Home Technology**

Another driver of the consumer robot industry is the increasing adoption of smart home technology. Smart homes are becoming more popular, and consumers are looking for ways to integrate their various smart devices into a cohesive system. Robots are seen as a key component of this system, and are being developed to work with other smart home devices, such as smart speakers, lighting systems, and security cameras.

### **Artificial Intelligence**

Artificial intelligence (AI) and machine learning are also driving growth in the consumer robot industry. These technologies are enabling robots to become more intelligent and adaptable, with the ability to learn from their environment and perform more complex tasks. This is opening up new possibilities for consumer robots, such as the development of personal assistants that can understand natural language and assist with a wide range of tasks.

### **COVID-19**

Finally, the COVID-19 pandemic has also had an impact on the consumer robot industry. With many people staying home and practicing social distancing, this accelerated demand for robots that can perform tasks such as cleaning and disinfecting. With the virus, cleaning robots are seen as a way to reduce the risk of infection and provide peace of mind to consumers. As a result of the virus, the adoption of these robots increased by 92% according to the International Federation of Robotics. Additionally, 50 service robot providers introduced disinfection robots that used ultraviolet light and disinfecting fluids to maintain hygiene and created a market for these robots in healthcare facilities after COVID-19.

### **Robotic Automation Processes**

The consumer robotics market is primarily driven by the growing demand for robotic automation processes. Robotic process automation technology uses intelligent software to complete high-volume, repetitive processes in a shorter duration, thereby saving significant amounts of time. Hence, it is increasingly becoming popular across a variety of business verticals such as contact center outsourcing, banking, financial services, insurance, business process outsourcing, procurement outsourcing, and human resource outsourcing. With the increasing adoption of robotics in diverse applications, the market growth is expected to accelerate.

### **Challenges - The High Cost**

The high cost associated with robotic systems might challenge the growth of the market players. Many consumers in the developing regions are reluctant to buy highly-priced service robots. Besides, continuous investments in research and development (R&D) to integrate advanced technologies by vendors have further increased the cost of consumer robots, which is limiting the adoption among consumers. These factors will hamper the growth of the market

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## Importance of Subsector

### **Substantial Impact**

Over the next few decades, we will see an accelerated need for advanced robotic solutions. The impact of robotics is becoming more significant as technology advances, as consumer preferences change exacerbated by the COVID-19 Pandemic, and as demand for robotic automation and services increase.

### **Aging Demographics**

Aging demographics will drive the need for increased service robot assistance for activities such as personal cognitive care, hygiene, and cleaning. For example, in Japan and Singapore, the increase in the aging population, the demand for long-term care and public spending on it is expected to increase. However, despite the need for more long-term care and spending, care providers are facing challenges regarding labour shortages, specifically skilled professionals in the care space. The demand for long-term care, alongside supply and labour shortages in the area, is anticipated to encourage the adoption of consumer robotics in long-term care for the elderly.

### **Education Sector**

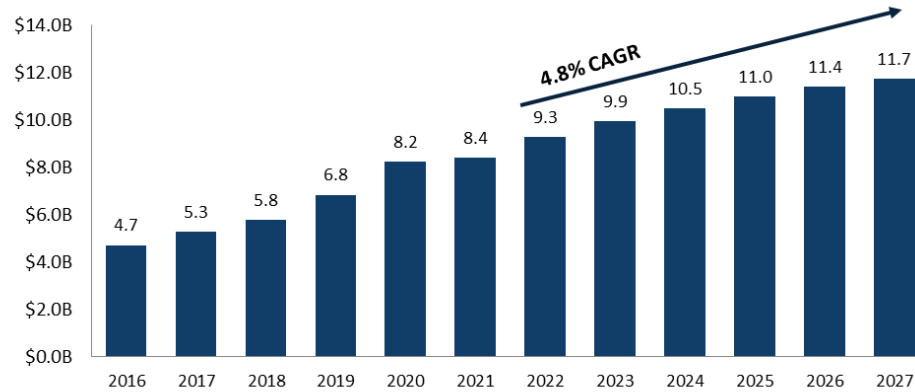
The education sector, especially across the Asia Pacific region (APAC), are increasingly adopting consumer robotics to support teaching. For instance, Pepper and Nao, a consumer robotic manufactured by Softbank, has been deployed in several preschools in Singapore to assist in the education of children. This is another example of an area that is expected to drive the consumer robotics market in the near-term.

### **Breakthrough in Technology**

Additionally, breakthroughs in technologies such as machine intelligence are enhancing human-to-robot interactions, allowing robots to be handled unsupervised. The demand for robotic process automation – across a variety of business verticals – is also on the rise, providing intelligent software to conduct high-volume, repetitive processes that are time-consuming and monotonous to humans. These can include various tasks such as account opening and closing, completing quotation requests, IT system testing and monitoring, and handling billing, invoices, and customer service queries.

### **Government Support**

Lastly, support from governments is another supporting factor driving market growth for consumer robotics. Many developed countries have robotics programs with a variety of strategic objectives. For example, the China Robot Industry Development Plan, which presents the country's objectives, includes creating three to five globally competitive robot manufacturers. Currently, China is raising its robot density to 100 robots per 10,000 workers and the country's 45% domestic market share is for high-end robots.

**Exhibit 2: Consumer Robotics Revenue and CAGR (USD Billions)**

### Growth

We are seeing industry-wide tailwinds that are driving the consumer robotics sector growth over the next decade, with Global News Wire forecasting a 5-year CAGR of 26.89%. Growth will depend on a host of factors, including the speed of technological breakthroughs, global economic growth, consumer preferences, and overall social acceptance of autonomous machines. For instance, within the domestic household robotics sub-vertical, we are seeing increased demand for robots that provide elderly assistance, perform various chores, as well as companionship, which has recently gained traction. Despite recent adoption and increased usability, one limiting factor towards adoption of household robots remains the high equipment costs that make it unaffordable to some consumer end-markets.

## History



**2001**

Dyson created a robotic vacuum *Turn it on*. The robot would sweep up dust, dirt, and debris; however, Dyson never launched the vacuum to the public.

\*Note\* photo is the reiteration



**UNECE 2003**

United Nations Economic Commission for Europe's World identified consumer robotics as a growing market, marking potential expansion in personal care and security applications



**2016**

Google released Google Home (now named Google Nest) a smart speaker and smart home hub that can be voice controlled.



**1990s**

The first consumer robotics product exposed to the public was the original Dwarf robots. People gained hands-on experience with a functional robot and was launched as part of an education program.



**2002**

Roomba by iRobot was introduced to the market. The Roomba is a self-floor cleaning device, and it was adopted successfully.



**2014**

Amazon launches Amazon Echo. The product is considered a smart home hub and is a speaker that can be voice controlled.

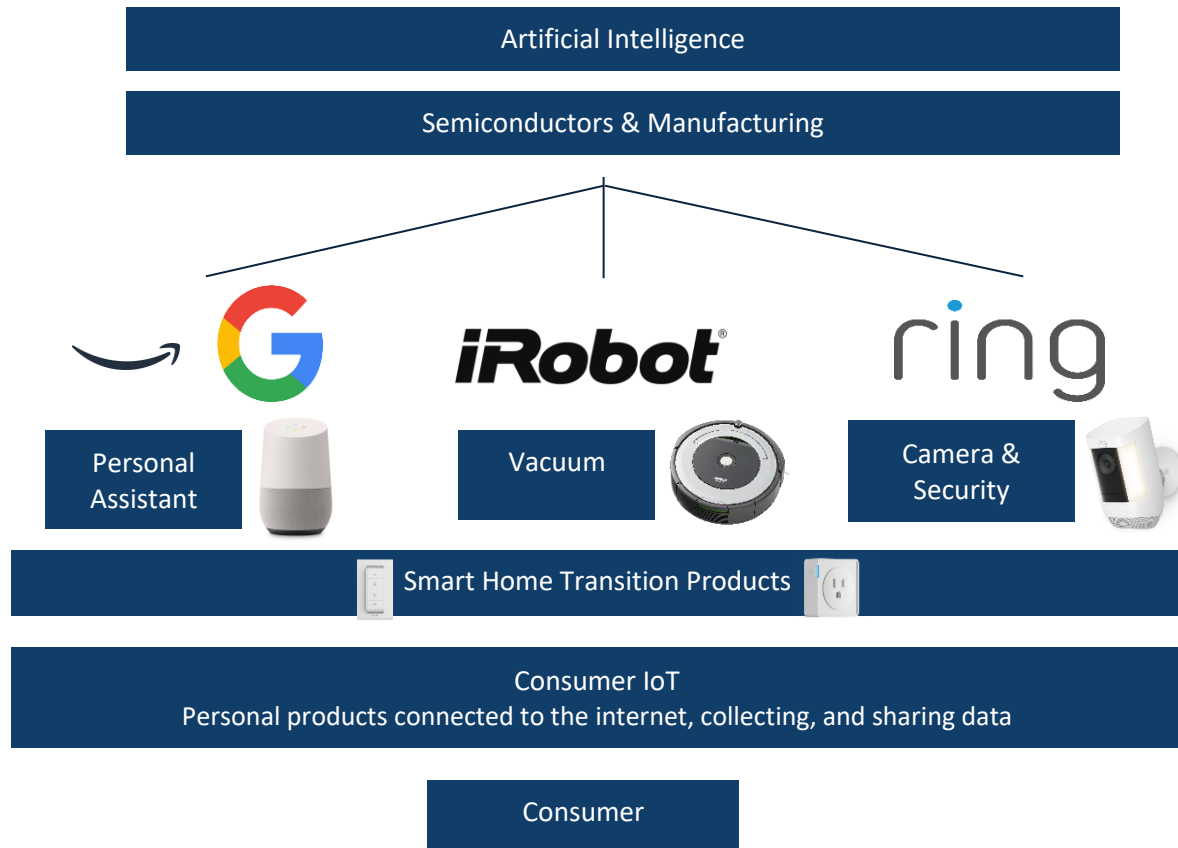


**2022**

Amazon announced an agreement of acquisition of iRobot for \$1.7B including its net debt.



## Value Chain



## Business Model and Case Studies

The business model of a consumer robot company typically involves developing and manufacturing robots for various applications, including household tasks, entertainment, and personal assistance. These companies often employ a combination of direct-to-consumer sales and partnerships with retailers and distributors to market and sell their products. One example of a successful consumer robot company is iRobot, which has built a business model based on developing and selling robot vacuums and other cleaning robots directly to consumers.

iRobot's business model revolves around producing high-quality, user-friendly robot vacuums that can effectively clean floors and carpets. The company has leveraged its proprietary technology to develop a range of products that appeal to different customer segments, including the popular Roomba line of robot vacuums. iRobot uses a direct-to-consumer sales approach through its website and has also partnered with retailers such as Amazon and Best Buy to expand its reach. Additionally, the company has expanded into other consumer robot markets, such as pool cleaning robots and lawnmowers, to diversify its product portfolio and increase revenue.

### Exhibit 3: The Lifetime Value of an iRobot Connected Customer

#### Get | Customer A | Non-Connected

	Initial Purchase
Revenue	\$250
Gross Margin	Mid-30%
Working Media Intensity	Moderate

- Single purchase primarily at retail
- Highly transactional
- Minimal visibility into future purchases
- Proven economies of scale

#### Get, Keep, Grow | Customer B | Connected Customer

	Initial Purchase	Multi-Year DTC Purchases	Total
Revenue	\$250	\$375+	\$625+
Gross Margin	Mid-30%	Low to Mid-40%	Low to Mid-40%
Working Media Intensity	Moderate	Low	-

- Initial purchase primarily at retail
- Retail-driven with personalized customers
- Customer purchase other products directly from iRobot
- More attractive economies for iRobot

Source: iRobot Investor Presentation (2021)

Another example of a successful consumer robot company is Anki, which developed a line of robotic toys and games that could interact with users through a smartphone app. The company's business model involved designing and manufacturing robots that could entertain and educate users while leveraging the power of mobile devices. Anki relied heavily on partnerships with retailers and distributors to market and sell its products, including major retailers such as Target and Amazon. However, despite initial success, the company faced financial challenges and ultimately closed its doors in 2019.

In addition to direct-to-consumer sales and partnerships, some consumer robot companies also leverage subscription-based business models to generate recurring revenue. One example of this is the pet monitoring company, Petcube, which developed a line of robotic pet cameras that allow users to interact with their pets remotely. Petcube's business model involves selling the hardware at a premium price and then offering a subscription service that provides additional features and benefits. The company also partners with retailers and distributors to reach a wider customer base.

Overall, the business model of a consumer robot company is centered on developing and selling robots that can improve and simplify daily life for consumers. Direct-to-consumer sales and partnerships with retailers and distributors are often key components of the business model, along with a focus on product quality and user experience. Subscription-based revenue models are also becoming more prevalent in the industry as companies look for ways to generate recurring revenue and provide ongoing value to customers.

The consumer robot industry has seen significant growth and innovation in recent years, with companies such as iRobot, Anki, and Petcube leveraging different business models to develop and sell their products. The success of these companies is rooted in a combination of factors, including product quality, user experience, partnerships, and subscription-based revenue models. As the industry continues to evolve, it will be interesting to see how these business models continue to develop and adapt to changing market conditions and consumer demands.

## Key Metrics and Key Success Factors

The consumer robotics industry is measured by various metrics that reflect market size, consumer demand, and technological advancements. One of the primary metrics is the market size, which is expected to grow significantly in the coming years. According to a report by Grand View Research, the global consumer robotics market size was valued at \$5.82 billion in 2020 and is expected to reach \$34.26 billion by 2028, growing at a compound annual growth rate of 24.8% from 2021 to 2028. This growth is driven by factors such as the increasing adoption of smart home devices and the demand for automation in household tasks.

Another important metric is the number of consumer robots sold. The International Federation of Robotics reported that a total of 8.6 million service robots for personal use were sold between 2014 and 2019, with the majority of these being vacuum cleaners. Furthermore, a report by the Consumer Technology Association found that the adoption of smart home devices is on the rise, with 69% of US households owning at least one smart home device in 2020. The report also noted that the global smart home market is expected to reach \$158 billion by 2024, with smart speakers, thermostats, and security systems being the most popular devices.

### Price Point

Price point is another key metric in the consumer robotics industry, with prices ranging from less than \$100 to over \$1,000. The affordability of consumer robots is an important factor in their adoption, and lower-priced devices are more accessible to a wider range of consumers. According to a report by IDC, the average selling price of consumer robots in 2019 was \$315, which is significantly lower than the price of professional service robots.

**Consumer Demographics**

Consumer demographics are also important metrics in the consumer robotics industry. According to a report by the Consumer Technology Association, men are more likely to own a smart home device or robot than women, with 60% of male consumers reporting ownership compared to 40% of female consumers. Additionally, the report found that 47% of consumers aged 25-34 reported owning a smart home device or robot, making this age group the most likely to own a smart home device.

**Application**

Application usage is another key metric in the consumer robotics industry, with cleaning, personal transportation, and entertainment being the top three uses of consumer robots. Robot vacuum cleaners are the most popular cleaning robots, while personal transportation devices such as electric scooters and hoverboards are gaining popularity. Entertainment robots, such as social robots and drones, are also becoming more prevalent in the consumer market.

**Consumer Satisfaction**

Customer satisfaction is an essential metric in the consumer robotics industry, as it can impact the adoption and repurchase of devices. According to a 2020 Vacuum Satisfaction Study by J.D. Power, iRobot, Shark, and Samsung are the top-ranked robot vacuum cleaner brands in terms of customer satisfaction. The study surveyed customers who had purchased robot vacuum cleaners within the past 12 months and evaluated the products based on factors such as performance, ease of use, and reliability. The study found that customers who were highly satisfied with their robot vacuum cleaners were more likely to repurchase the same brand and recommend it to others.

**Innovation and Patents**

Innovation and patents are also critical metrics in the consumer robotics industry, as they reflect advancements in technology and market competition. The number of patent applications related to robotics increased by 40% between 2014 and 2018, according to a report by the World Intellectual Property Organization. This growth is attributed to the increasing development of robotic technology and the growing interest in the field.

## Competitive Landscape

**Competitor Analysis**

The market is fragmented with many players occupying the market. It comprises several large companies competing for market share, while smaller rivals and start-ups are trying to push innovation in areas that have potential to generate high profits. However, Amazon is the largest producer, with more than 27% of the market share, followed by Google, with a market share of about 20% solidify their position by expanding product offerings and establishing cross-collaborative partnerships with other large robotics players in the market. For example, iRobot Corporation, a prominent American technology company that design and builds consumer robots, such as the Roomba vacuum and Braava floor moppers, announced a partnership with Amazon in 2021 to advance voice-enabled intelligence further using Amazon's voice assistant Alexa, which will result in more thoughtful, proactive smart home automation.

The consumer robot industry has seen significant growth in recent years, with many companies entering the market to develop and sell robots for various applications, including household tasks, entertainment, and personal assistance. As a

result, the competitive landscape of the industry is dynamic and constantly evolving, with both established players and new entrants vying for market share.

### Key Players

One of the key players in the consumer robot industry is iRobot, a company that has built a strong reputation for developing high-quality robot vacuums and other cleaning robots. iRobot has a significant market share in the robot vacuum segment, with its Roomba line of products being one of the most popular and widely recognized in the industry. iRobot has reported an average revenue growth of 17% YoY between 2018 to 2020, growing from US\$1.09B to US\$1.39B. The company has also expanded into other consumer robot markets such as pool cleaning robots and lawnmowers, to diversify its product portfolio and increase revenue. In addition to home cleaning, there are also companies in the personal assistance space including SoftBank Robotics. SoftBank Robotics produces a range of robots for entertainment and personal assistance, including the "Pepper" robot. Pepper is designed to interact with humans and can recognize emotions, carry out conversations, and provide information. Moreover, Boston Dynamics is robotics company that designs and builds advanced robots that can move, dance, and interact with humans. Their robot "Spot" is designed to be a personal assistant and can perform tasks such as carrying objects, opening doors, and navigating complex environments.

Another key player in the consumer robot industry is Xiaomi, a Chinese company that has rapidly gained market share in the robot vacuum segment. Xiaomi's robot vacuums are known for their affordability and advanced features, making them a popular choice for budget-conscious consumers. The company has also developed a range of other consumer robots, such as air purifiers and smart speakers, to expand its presence in the industry. Driven in part by its expansion into new product categories such as consumer electronics and smart home devices, Xiaomi reported revenue of approximately CNY 245.9 billion (approximately USD 36.7 billion) in 2020, representing a year-over-year growth rate of 19.4%. While Xiaomi has not disclosed specific revenue figures for its consumer robot segment, it has reported strong sales of its robotic vacuum cleaner products. In 2020, Xiaomi's Mi Robot Vacuum-Mop Pro was named the best-selling robotic vacuum cleaner in the Chinese market.

Dyson, a well-known brand in the household appliance industry, has also entered the consumer robot market with its line of robot vacuums. Dyson's robots are known for their powerful suction and advanced technology, and the company has invested heavily in research and development to stay ahead of the competition.

In addition to these established players, there are also many new entrants in the consumer robot industry, including startups and emerging companies. For example, Boston Dynamics, a company known for developing advanced robotics technology, has recently entered the consumer robot market with its robot dog, Spot. While still relatively new to the market, Spot has generated significant interest among consumers and industry experts alike, highlighting the potential for new and innovative products in the industry.

### Key Trends

#### Growing Demand in Personal Robots to Aid in Everyday tasks

Consumers are more accepting of robot disruption and change. After the normalization and adoption of the robot vacuums with the everyday consumer, people are more open to adopting and trusting technology and robots to replace tasks. This creates a demand and slightly lower decrease in barriers for new launched products. The prices of cleaning consumer robots have decreased by around 20-30% over the past few years allowing it to be easier for consumers to adopt. Many new robots and products are accessible and affordable. Robotics is no longer exclusive for luxury or industrial robotics.

### **Shift to Personal Assistant**

Cleaning robots currently hold the largest market share in the consumer robotics industry with a revenue share of 42% in 2021. The domestic task sub-market adoption is shifting from largely dominated cleaning robots to more robotic personal assistants. This is apparent with the launch and adoption success of the Google Nest and Amazon Echo. With these being popular consumer robots, the industry is emphasizing interactive connected devices and bridging the gap between traditional homes and smart homes.

The new products allow for a cost-effective method of achieving similar effects.

- 1) **Technological advancements:** Advances in technology, particularly in areas such as sensors, artificial intelligence, and machine learning, have made it possible to produce robots with greater functionality at a lower cost. As technology continues to evolve, it is expected that consumer robots will become even more cost-effective.
- 2) **Economies of scale:** As the market for consumer robots continues to grow, manufacturers are able to take advantage of economies of scale by producing robots in larger quantities, which reduces per-unit costs.
- 3) **Competition:** Increased competition among manufacturers has led to price competition, with companies offering more affordable robots to gain market share.
- 4) **Streamlined production processes:** Many manufacturers have streamlined their production processes, making them more efficient and reducing costs. For example, some robots are now assembled using 3D printing technology, which can reduce material waste and production time.
- 5) **Cost-sharing models:** Some manufacturers are offering cost-sharing models, where the cost of the robot is spread out over a longer period of time through subscription or leasing models.

### **Increase in Investments and Start-ups, but Major Players are Growing**

Start-ups less than 5 years old make up 15% of the companies within the consumer and services robotics market according to research from the International Federation of Robotics (2018). There are increasing investments within the space creating more competition; however, building trust and strong brand name to gain majority adoption has been proven to be difficult. Despite the increase in new players, achieving adoption levels similar to players like iRobot is rare.

The trend is for large established players from other markets to acquire existing companies within the consumer market, such as Amazon's acquisition of Ring and iRobot. These players have strong cash flow for investing in acquisitions, research, and development. This makes it difficult for small players to gain market share first and establish a brand name.

### **Adoption of Robots in Different Areas**

While consumer robotics are concentrated mostly with cleaning robots and home assistant robots, there are also players and strong opportunities for innovation in areas such as healthcare for the aging population, consumer protection and

security, education, companion, and many more. The consumer robotics market is broad and the touch point of inconvenience is an opportunity for innovation. However, adoption still remains to be a high barrier in the success of a company in this space.

### Characteristics for Adoption Success

A good product is one of many key factors in gaining success in the consumer market. The product must be acceptable for people to be willing to share their daily lives with it. This means the product should:

- Have sufficient agility to complete its tasks, meaning enough power and longevity
- Be adaptable and robust enough for potential changing environments
- Have its appearance target and be accepted by the target consumers
- Be perceived as trust-worthy through its safety and durability features to ensure constant positive interactions

### Consumer Robots Valuation Commentary

The global Consumer Robotics market has grown immensely in recent times as robotic automation is gaining a foothold in domestic household duties, and yet, the industry still has a long run-way of growth. Increased affordability due to manufacturing technological progress, changing consumer preferences and social trends, and tailwinds in artificial intelligence and other technological advances that promote human-to-robot interactions will continue to drive demand and market growth for Consumer Robots. The aftermath of Covid-19 along with aging global demographics will result in greater need for service robots to assist with domestic tasks and will only accelerate adoption. The relatively robust growth profile of Consumer Robotics in the near-and-medium-term brings us to understand the valuation behind these businesses.

EV / Revenue: Revenue sometimes used over EBITDA as some Consumer Robotics businesses are early-stage pre-revenue companies. We see often in smaller, start-up like private companies in the space.

### Trading Comparable Company Analysis

In our analysis below, we've provided a select number of companies that we've been tracking. These companies are notable due to their size, scale, significant brand reputation, and/or market share.

We have divided the Consumer Robotics ecosystem into several main verticals based on functionality. The first, household robots, broadly encompasses home duties such as vacuum and mopping, lawn mowing, companionship, and other similar applications. Household robots is a type of service robot that is used for household chores. Other functionalities include hospitality, personal assistance, entertainment, security, and pet care. However, we have not included these functionalities in our trading comparable as the large players in the space are private.

**Exhibit 4: Consumer Robotics Valuation Overview**

(Figures in mm USD)

Comparable Universe Consumer Robotics Companies As of Mar 15, 2023	Market Cap. (\$ M)	Enterprise Value (\$ M)	Trading Multiples						EV/EBITDA			EBITDA	FCF	3-Year
			LTM	NTM	FY1	FY2	LTM	NTM	FY1	FY2	Margin	Yield	EBITDA Growth	
			(\$ M)	(\$ M)	(\$ M)	(\$ M)	(\$ M)	(\$ M)	(\$ M)	(\$ M)	(%)	(%)	(%)	
<b>Pure-Play Household</b>														
SEB SA	\$ 5,731	\$ 8,106	1.0x	0.9x	1.0x	0.9x	10.9x	8.2x	9.0x	8.0x	8.9%	-	(5.1%)	
Kingclean Electric Co.	2,413	2,274	1.8x	1.6x	1.7x	1.5x	22.3x	13.2x	13.7x	11.9x	8.3%	(2.7%)	4.4%	
Ecovacs Robotics Co.	6,931	6,523	3.0x	2.7x	2.9x	2.4x	22.4x	17.3x	21.1x	16.4x	17.9%	2.1%	75.7%	
Ningbo Fujia Industrial Co.	1,180	1,113	2.9x	2.8x	2.8x	2.5x	22.7x	21.1x	21.1x	17.7x	9.8%	9.7%	-	
Ningbo Dechang Machinery Co.	810	550	1.8x	1.4x	1.8x	1.3x	15.2x	8.5x	13.0x	7.7x	12.7%	6.0%	-	
iRobot Corporation	1,204	1,124	1.0x	1.0x	1.0x	0.9x	(6.5x)	(12.1x)	(12.1x)	(83.4x)	(14.7%)	(2.4%)	-	
Beijing Roborock Technology Co.	4,658	3,883	4.0x	3.4x	3.4x	2.9x	19.3x	16.6x	16.6x	12.9x	21.0%	-	14.6%	
Xiaomi Corporation	34,779	29,097	0.7x	0.7x	0.7x	0.7x	23.1x	21.8x	21.2x	14.8x	6.7%	(2.2%)	(3.0%)	
<b>Median</b>			<b>1.8x</b>	<b>1.5x</b>	<b>1.8x</b>	<b>1.4x</b>	<b>20.8x</b>	<b>14.9x</b>	<b>15.2x</b>	<b>12.4x</b>	<b>0.1x</b>	<b>0.0x</b>	<b>4.4%</b>	
<b>Mean</b>			<b>2.0x</b>	<b>1.8x</b>	<b>1.9x</b>	<b>1.6x</b>	<b>16.2x</b>	<b>11.8x</b>	<b>13.0x</b>	<b>0.7x</b>	<b>0.1x</b>	<b>0.0x</b>	<b>17.3%</b>	
<b>Conglomerate</b>														
Omron Coporation	\$ 10,912	\$ 10,557	1.7x	1.6x	1.6x	1.7x	11.6x	12.0x	11.3x	12.3x	14.8%	(1.9%)	10.6%	
Samsung Electronics Co.	303,506	231,178	1.0x	1.1x	1.1x	1.0x	3.7x	5.6x	5.6x	3.7x	27.3%	1.0%	13.6%	
Alphabet Inc.	1,233,507	1,149,722	4.1x	3.8x	3.8x	3.4x	12.7x	9.9x	9.9x	8.7x	32.1%	18.7%	24.0%	
Amazon.com Inc	1,233,507	1,149,722	4.1x	3.8x	3.8x	3.4x	12.7x	9.9x	9.9x	8.7x	32.1%	18.7%	24.0%	
<b>Median</b>			<b>2.9x</b>	<b>2.7x</b>	<b>2.7x</b>	<b>2.6x</b>	<b>12.1x</b>	<b>9.9x</b>	<b>9.9x</b>	<b>8.7x</b>	<b>0.3x</b>	<b>0.1x</b>	<b>18.8%</b>	
<b>Mean</b>			<b>2.7x</b>	<b>2.6x</b>	<b>2.6x</b>	<b>2.4x</b>	<b>10.1x</b>	<b>9.4x</b>	<b>9.2x</b>	<b>8.3x</b>	<b>0.3x</b>	<b>0.1x</b>	<b>18.1%</b>	
<b>Total Median</b>			<b>1.8x</b>	<b>1.6x</b>	<b>1.8x</b>	<b>1.6x</b>	<b>13.9x</b>	<b>11.0x</b>	<b>12.1x</b>	<b>10.3x</b>	<b>0.1x</b>	<b>0.0x</b>	<b>13.6%</b>	
<b>Total Mean</b>			<b>2.2x</b>	<b>2.1x</b>	<b>2.1x</b>	<b>1.9x</b>	<b>14.2x</b>	<b>11.0x</b>	<b>11.7x</b>	<b>3.3x</b>	<b>0.1x</b>	<b>0.0x</b>	<b>17.6%</b>	

## Risks

### Legal and Regulatory Environment

APAC remains a large market for Consumer Robotics. Significant developments in the U.S. trade policies could have a material adverse effect on the global market. We've seen a consistent hike in U.S. government tariffs on goods imported from China. These tariffs, and other governmental actions could directly or indirectly adversely impact the Consumer Robotics industry through a host of impacts, including demand for products, costs, customers, suppliers, and distributors. In response to uncertain international trade policies, some North American based companies have already started to relocate supply chains out of China. Uncertainty remains high as to the short-term and long-term future of economic relationships between the two countries.

### Macroeconomic Conditions

The industry has seen material reductions in consumer demand. Poor macroeconomic conditions impacting consumer demand poses a significant risk factor for the Consumer Robotics Industry. Continued economic uncertainty and reduction in consumer spending, as we've seen in international markets such as Europe, China, and Japan, have and may continue to result in reductions in sales for Consumer Robots. In addition, disruptions in credit markets may limit the availability of liquidity for some companies seeking to fund operations through the capital markets.

### Labor Struggles

For Consumer Robotics companies to execute their growth plans, they must attract and retain highly qualified employees. However, competition for hiring these employees is intense, especially engineers with high levels of experience in developing robots and engineers with expertise in artificial intelligence, machine learning, data science, and cloud applications. As such, attracting and retaining qualified personnel is a key risk factor facing the industry.



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