

Humanoid Robot: Applications, Components and Global Markets

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- The global market for humanoid robots should grow from \$2.1 billion in 2020 to \$7.9 billion by 2025, at compound annual growth rate (CAGR) of 30.6% for the period of 2020-2025.
- Wheeled humanoid robots should grow from \$1.3 billion in 2020 to \$4.7 billion by 2025, at a CAGR of 28.5% for the period of 2020-2025.
- Bipedal humanoid robots should grow from \$753.3 million in 2020 to \$3.2 billion by 2025, at a CAGR of 33.9% for the period of 2020-2025.



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Chapter 1: Introduction

Introduction

Humanoid robots look like humans. Humanoids that look like males are called androids and those that look like females are called gynoids. These robots are built to simulate human motion and interact like human beings. Humanoid robots are still in the innovation phase. With the introduction of artificial intelligence (AI), several smart humanoid robots have been developed, ready to serve as companions or helpers for humans in daily life or during disasters. Humanoids fall under the category of service robotics, performing professional services such as research and space exploration, personal assistance and caregiving, education and entertainment, search and rescue, manufacturing and maintenance and public relations, among others.

The global coronavirus disease of 2019 (COVID-19) pandemic resulted in demand growth for humanoid robots. Several countries have rushed to deploy humanoids as hospital support staff and to assist nurses, giving them breaks. For example, the Smart Field Hospital (a field hospital staffed by robots), opened in Wuhan, China, in early March 2020. In this hospital, CloudMinds Technology donated humanoid robots to perform tasks such as disinfecting the facility, monitoring temperatures, distributing food and medicine and providing information and entertainment to medical staff and patients.

At this point, humanoid robots can help in restoring financial activities. These robots can replace humans in several places, reducing human-to-human interaction, decreasing the chances of further spreading the virus. After recovery, physical work will resume and these robots will be in several new application areas, including warehouses, production facilities, reception areas, hotels and retail stores.

Study Goals and Objectives

This research study is an industry analysis of the humanoid robot market with goals and objectives:

- Study the value chain and Porter's five forces impact on the humanoid robot industry ecosystem.
- Analyze market trends that are driving or restraining the market.
- Calculate current global market size and project growth over the next five years based on previous market trends.
- Understand upcoming market opportunities and areas of focus to forecast the market by various segments.
- Identify market size based on segments, including types, applications and verticals.
- Examine region-specific developments in the industry.
- Understand major stakeholders in the market and the competitive landscape for market leaders.
- Examine the impact of the COVID-19 pandemic on the humanoid robot industry.

Reasons for Doing This Study

The humanoid robot market is on a substantial growth trajectory, due to ongoing technological advancements in the AI field resulting in more user-friendly robots. This ultimately generates a, potentially, wide range of commercial applications for the technology. The humanoid robot market is set to be a substantial enabler of dramatically improved personal assistant services after the COVID-19 pandemic. Humanoid robots are rapidly gaining popularity among several end-use sectors: retail, hospitality, healthcare, education and scientific research, residential, military and defense, construction, underwater systems and many more.

Over the forecast period, the humanoid robot market is expected to gain widespread popularity, in several applications, across several industries. This study was conducted to understand the current state of the humanoid robot market and to illuminate full exploitation of its benefits. This study will serve as a guide and benchmark for humanoid robot market players and end users of the products. Decision-makers will find the information useful for developing business strategies and identifying areas for R&D.

Scope of Report

- The scope of the report includes the global market for commercially-deployed humanoid robots.
- Robots in the pilot phase or those that are live for demonstration purposes have not been considered to calculate overall market size.
- Market size includes the market of both hardware and software.
- The after-sales service market (software upgrade or hardware maintenance) has not been considered in the report.
- The rental service market for humanoid robots has not been considered in the report.
- The report includes both bipedal and wheeled humanoid robots for the calculation of the overall market size.
- Humanoid robotic kits have not been considered in the report scope.

Information Sources

The sources used to obtain information for this extensive and technical study of the humanoid robot market include:

- Primary sources:
 - Selected experts from related industries.
 - Preferred suppliers.

- Secondary sources:
 - E-magazines.
 - Directories.
 - Research papers.
 - White papers.
 - Databases including OneSource, Factiva, Bloomberg, the Security and Exchange Commissions (SEC) for company filings, Reuters and company websites.
 - Robotics related association websites including the International Federation of Robotics (IFR), the Robotic Industries Association, the International Journal of Robotics Research and the Association for Advancing Automation.

Methodology

This study is the outcome of an intensive study of the market. It includes a thorough analysis of products and players with related data collected from secondary sources and primary interviews. All critical data, including qualitative information, quantitative insights and prospects, have been obtained and verified by conducting primary expert interviews. Market estimation was done using both top-down and bottom-up approaches, followed by data triangulation and trend-based data forecasting.

- For the bottom-up approach, the global shipments from past years have been tracked and the value of the overall market has been calculated by multiplying respective shipments of a particular robot with its average selling prices (ASPs). Shipments and ASPs have been tracked from both primary interviews and secondary sources.
- For the top-down approach, system manufacturer revenue from past years has been calculated, based on market share. The overall market value has been calculated. Company websites, annual reports, SEC filings and primary interviews were tracked to obtain market player revenue.
- Product mapping was done during the study of players to triangulate the overall derived market data of different segments. Company presence and ongoing research activities were used to determine regional trends.
- To forecast market size, past data analysis and current market trends have been studied to provide an estimated market size for the coming years.

A company's product offerings, revenue from related markets and recent developments have been used to do competitive benchmarking.

Intended Audience

This report is of interest to:

- Raw material suppliers.
- Manufacturing equipment suppliers.
- Electronic design automation (EDA) and design tool vendors.
- Component manufacturers/original device manufacturers (ODMs).
- Integrated device manufacturers (IDMs).
- System integrators/original equipment manufacturers (OEMs).
- ODM and OEM technology solution providers.
- Assembly, testing and packaging vendors.
- Software service providers.
- Suppliers and distributors.
- After sales service providers.
- End users.
- Intellectual property (IP) and licensing providers.
- Research institutes.
- Government bodies.
- Regulatory authorities.
- Investors and venture capitalists.
- Consulting firms.

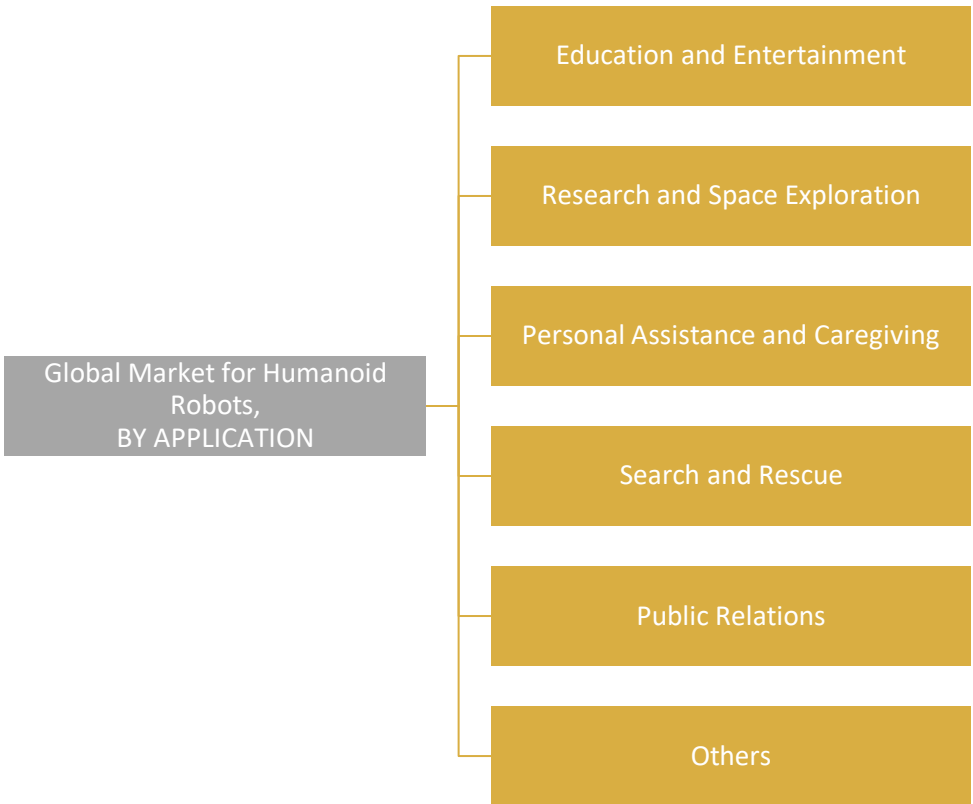
Geographic Breakdown

In this report, the geographic regions considered for market analysis include and only include:

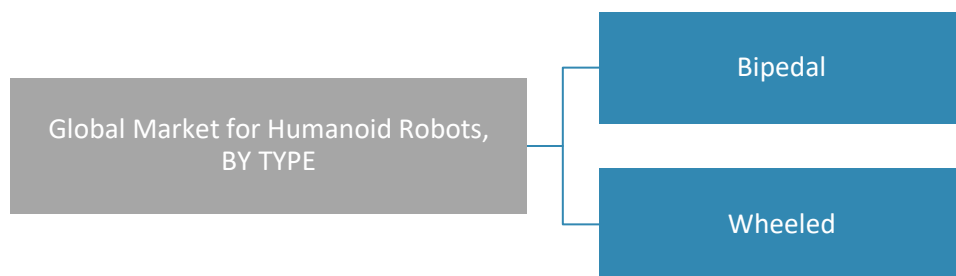
- Americas.
- Europe.
- Asia-Pacific (APAC).
- Middle East and Africa (MEA).

Note: Other applications include inspection, maintenance and disaster response.

Global Market for Humanoid Robots, by Application



Global Market for Humanoid Robots, by Type



Global Market for Humanoid Robots, by Vertical



Note: Other verticals include military and defense, construction, underwater, manufacturing, stadiums and amusement and theme parks.

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Chapter 2: Summary and Highlights

Humanoids robots are built in order to simulate human motion and interact like human beings. Robotic process automation has been implemented for decades, but humanoid robotics is still an emerging technology that has gained exceptional prominence over the past few years. Though humanoid robots currently represent a very small portion of the service robot market, this market has huge potential to become the engineering tool of the future.

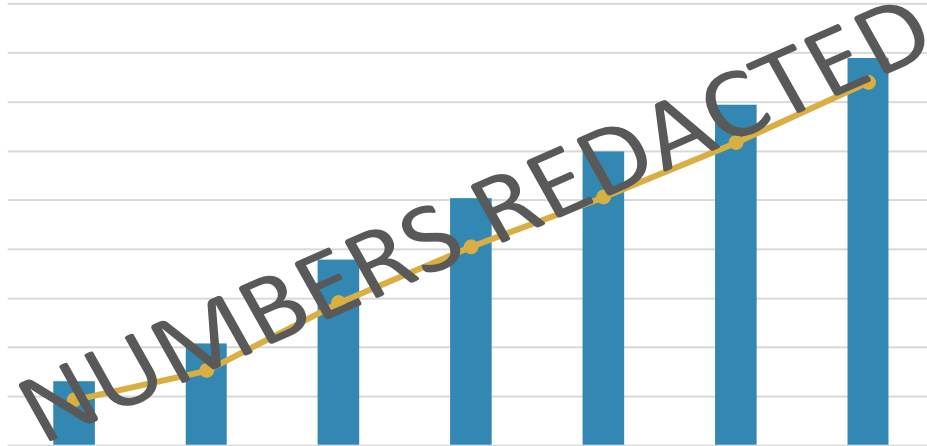
Before the COVID-19 pandemic, the humanoid robot market was valued at around REDACTED in 2019. However, the global pandemic has resulted in demand growth for humanoid robots. Several countries have rushed to deploy humanoids as hospital support staff. At this point, humanoid robots can restore financial activities, replacing humans in many environments, reducing human-to-human interaction and decreasing the chances of further spreading the virus. The humanoid robot market is expected to grow from REDACTED in 2020 at a compound annual growth rate (CAGR) of REDACTED to reach REDACTED by 2025. The global shipments of humanoid robots are expected to reach almost a million units by 2025, up from REDACTED in 2020, growing at a CAGR of REDACTED between 2020-2025.

Summary Table:
Global Market for Humanoid Robots, Through 2025
(\$ Millions/Thousand Units)

Parameters	2019	2020	2021	2022	2023	2024	2025	CAGR% 2020-2025
Market value (\$ millions)	1,315.8							
Shipments (thousand units)	123.3							

Source: BCC Research

Summary Figure:
Global Market for Humanoid Robots, 2019-2025
(\$ Millions/Thousand Units)



Source: BCC Research

Promobot, UBTECH Robotics, Qihan Technology, SoftBank Robotics and PAL Robotics are ranked as the top five players in the 2020 humanoid robot market. With broad product portfolios serving a wide range of applications, these players are market leaders. To properly exploit the opportunities provided by the COVID-19 pandemic, players have aligned existing product portfolios in order to serve major industry verticals.

Major trends in the humanoid robot market:

- Ever-advancing technological developments make humanoid robots more usable and consumer-friendly, by adding new features and functionalities, ultimately boosting the adoption of these robots.
- Humanoid robots are in huge demand from retail store owners, who have already started procuring and deploying humanoid robots in stores to combat the post-pandemic situation and attract and serve customers.
- During, early 2020, humanoid robots handled COVID-19 panic situations at healthcare facilities by assisting and providing relief to over-burdened medical staff.
- There is a growing trend toward adopting these robots in hazardous environment industries, natural disaster recovery and military and defense fields.

- Huge capital investment is required from market players at all phases of development. This, along with the fact of huge expenditure on maintenance by the end-user, still acts as a restraint to growth for the humanoid robot market.
- Product shortage justifies high price. Buyers are sidestepping, investing money into the technology and restraining widespread adoption.

The easy implementation of application-specific features in wheeled humanoid robots leads to wide deployment in almost every field, making wheeled humanoid robots a larger market shareholder (around REDACTED in 2020). However, the advanced features offered by bipedal humanoid robots attracts more opportunities in several unfolded application areas, resulting in a higher growth rate (REDACTED during the forecast period).

The humanoid robot market is strongest in the public relations application, closely followed by the personal assistance and caregiving applications. These two application areas, collectively, are expected to hold almost two-thirds of the market share throughout the forecast period. The huge adoption of humanoid robots for these applications can be attributed to the ability of a humanoid robot to autonomously interact with humans, serving the role of human communicator.

The COVID-19 pandemic has impacted the economy, worldwide, by forcing nations to go into lockdown for months. The corporate world is looking for a solution that can get the economy rolling, again. The post-pandemic invasion of humanoid robots into the commercial world could restore financial activities by serving in high touch jobs. This makes the hospitality application the fastest growing vertical, with a CAGR of REDACTED during the forecast period.

APAC has always been the leader in this market, not only in R&D, but also in deployment of the technology across industries in the region. The large number of players present in the APAC region means that the most sophisticated and advanced robots are highly available at lower prices. This is expected to further augment the adoption of humanoid robots in the APAC region. Early adoption of the technology coupled with easy availability will result in APAC holding the largest market share, regionally.

Success stories of humanoid robots in the Asian region have attracted lots of foreign players from the American and European regions that are interested in development and deployment of the technology. Several new market players have emerged from these regions in the last decade. Interestingly, the technology has also found its way into several industry verticals for full-fledged deployment in those two regions. This eventually leads to the highest market growth rate recorded in the American region, closely followed by the European region. The market is expected to follow the same trend throughout the forecast period.

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