Emerging Technologies: How Vendors Can Differentiate Across the Smart Robot Value Chain

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The value chain for robots remains highly fragmented, with vendors struggling to differentiate as the hyperscalers move in and customers look for industry experts. Product leaders must prioritize investment to focus on points in the value chain that offer the best opportunities for differentiation.

KEY INSIGHTFULL DOCUMENT

Overview

Key Findings

- Many vendors are pushing into different parts of the smart robot value chain, providing software, hardware and management services to fill perceived gaps, while spreading their resources dangerously thin.
- Products such as AWS IoT RoboRunner, Google's Edge TPU and Microsoft's Project Bonsai demonstrate how the hyperscalers are increasingly interested in providing management services (including multiagent orchestration) and thus filling some points in the value chain.
- Gartner's case-based research (CBR) shows that customers consistently value vendors' knowledge of their industry higher than robotic knowledge or experience.

Recommendations

To leverage the impact of emerging robotic technologies and trends on products and services, product leaders should take these steps:

- Demonstrate value by focusing on points in the chain where you can provide a differentiated proposition.

- Avoid disruption from hyperscalers by working with them, integrating points of value into the hyperscaler offerings to increase the value of both.
- Exploit specialist knowledge and experience by targeting the right industry verticals, and ensuring that potential customers are aware of your expertise.

Strategic Planning Assumption

By 2026, 75% of smart robots deployed into enterprises will be linked (directly or indirectly) with robot management services run by one of the hyperscalers, up from less than 2% in 2021.

Analysis

Technology Description

A smart robot is an AI-powered, often mobile, physical machine designed to autonomously execute a targeted mission. A targeted smart robot mission has a predictable outcome where the robot learns within a range of defined parameters or unpredictable outcomes but within a specific range of parameters.

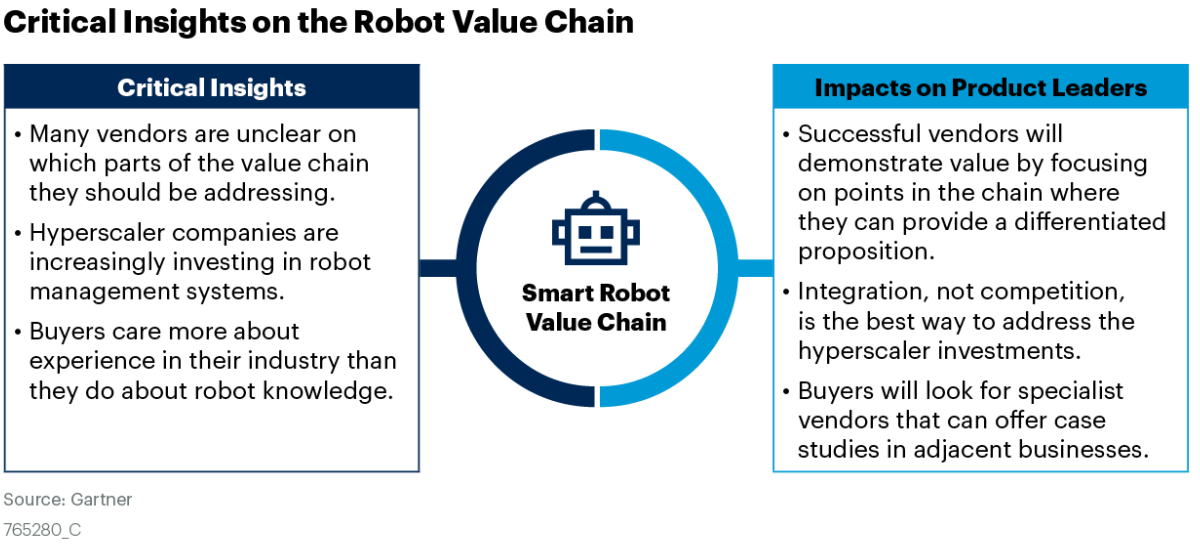
Robot categories: Personal robots, medical robots, intralogistics robots (operating inside facilities), asset inspection robots, educational robots, agricultural robots and more. See Note 1 for a fuller description.

Example providers include:

- Intralogistics robot (including autonomous mobile robot [AMR]) providers: Berkshire Grey, BionicHIVE, Geek+, Grenzebach, GreyOrange, inVia Robotics, Locus Robotics, Rayputa Robotics, Seegrid, Vecna Robotics and Zebra (Fetch)
- Asset inspection robot providers: Boston Dynamics (Spot), DroneDeploy and Percepto
- Commercial security robot providers: Enova Robotics and SMP Robotics
- Educational robot providers: Van Robotics (ABii)
- Exoskeleton providers: German Bionic and Sarcos Robotics
- Robotic AI platform providers: Cognite, IBM, InOrbit and Levatas
- Workplace robot providers: Ava Robotics

This document presents insights on the robot value chain gleaned from a Gartner CBR project conducted from November 2021 through January 2022. Figure 1 provides an overview.

Figure 1: Critical Insights on the Robot Value Chain



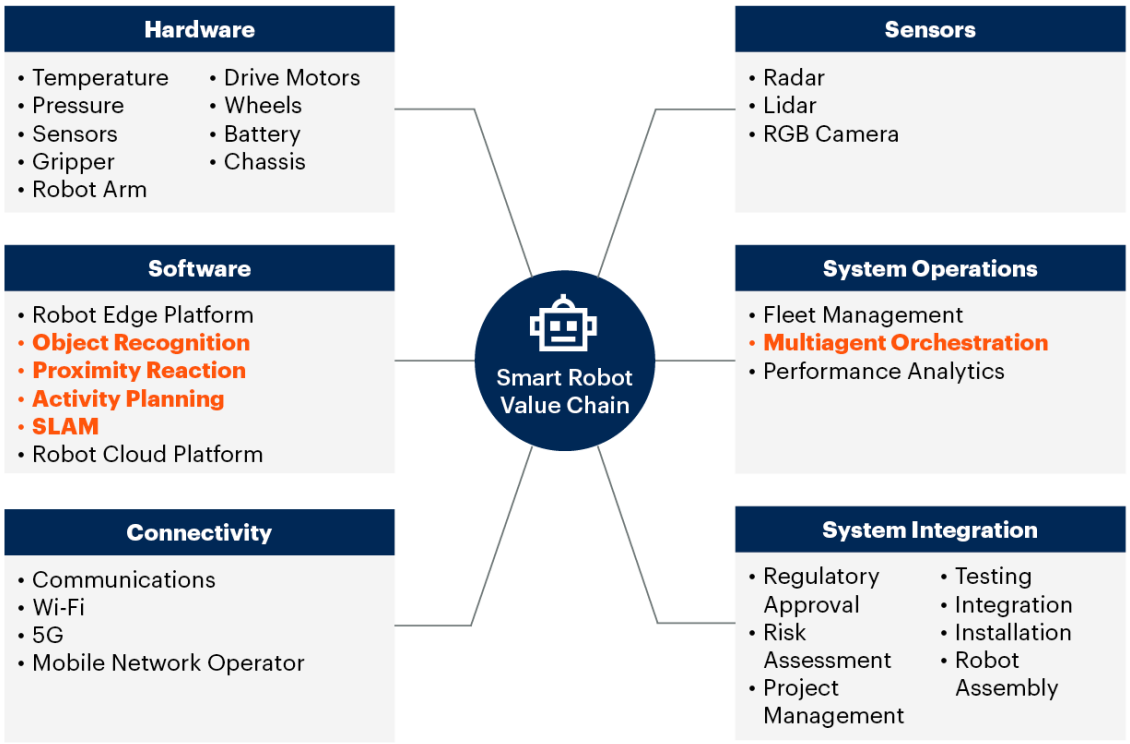
Critical Insights

Critical Insight: Many Vendors Are Unclear on Which Parts of the Value Chain They Should Be Addressing

The ecosystem around smart robots remains highly fragmented, with numerous vendors supplying varied parts and companies often extending offerings into areas beyond their expertise. In many cases, the barriers to entry are quite low, enabling startups and new business units to rapidly bring products to market. A smart robot deployment will involve a number of components, including hardware, software and management systems, with multiple vendors supplying different parts through direct relationships with the end user or via value-adding supply chains. Figure 2 shows the most important sections of this value chain, highlighting those that provide the greatest opportunity for differentiation and where buyers should pay most attention to product capabilities and longevity.

Figure 2: Components Needed to Drive the Smart Robot Value Chain

Components Needed to Drive the Smart Robot Value Chain



Source: Gartner
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Gartner

Near-Term Implications

Almost all the vendors of smart robots approached in Gartner's CBR project planned migration away from hardware production. The only exception to this was the gripper (manipulator) itself, where a few companies feel their industrial design creates some measure of differentiation and will continue to make their own gripping technology. The expectation is that companies with experience in large-scale manufacturing, and based in locations with low labor costs, will exploit economies of scale and local supply chains to reduce prices (margins) — no specialist knowledge will be needed to make robots. That will leave software as the key point of differentiation between vendors.

In general, vendors should look to add more capabilities for greater functionality, while systems integrators simplify the user journey and smooth the deployment experience. In Table 1, we identify specific points in the value chain where vendors should focus.

Table 1: Value Chain Points Where Vendors Should Focus to Provide Differentiation

Area	Differentiation
Simultaneous location and mapping (SLAM)	SLAM dynamically defines the physical environment and the robot's position within that space, reducing the complexity of installation by removing the need for floor plan or manual mapping. Products differentiate on the level of automation in map creation and the detail provided. Robots deployed in frequently changing environments are particularly reliant on SLAM.
Object recognition and handling capabilities	Analysis of single frames or continuous video is used to pick different objects from a tote or other storage system, such as a warehouse shelf. Differentiation may involve recognizing a variety of objects, or extend further with the robot understanding that the objects need to be packed in a specific way, to optimize packaging material or prevent in-package motion.
Proximity/emergency reaction	On-robot intelligence must react to humans, or other equipment, nearby, to avoid injury or damage. Differentiation may involve more intelligent responses. Just shutting down during a fire alarm, for example, may result in a robot blocking an exit or carrying a dangerously unstable load; responses should be more intelligent.
Activity planning	This is the control console from which robots are dispatched, monitored and interrupted, often with immediate effect and involving work management across a fleet of robots from different vendors. The provision of a highly intuitive interface is a critical point of differentiation. This interface must be usable by staff on the ground, who may not be trained in robot operations, and the majority of vendors have worked hard to create interfaces that are instinctively operable.

Multiagent orchestration platform	End users will want to integrate mission management of different systems (including robotic systems) into a single interface, making the APIs and integration more important than a vendor-specific human/computer interface. This is an area where investment from vendors is lacking, as they would (in general) prefer customers to use their own interface. So buyers need to be certain that their selected vendor at least has a roadmap toward providing appropriate mechanisms for integration.

Source: Gartner (May 2022)

Recommendations for Product Leaders

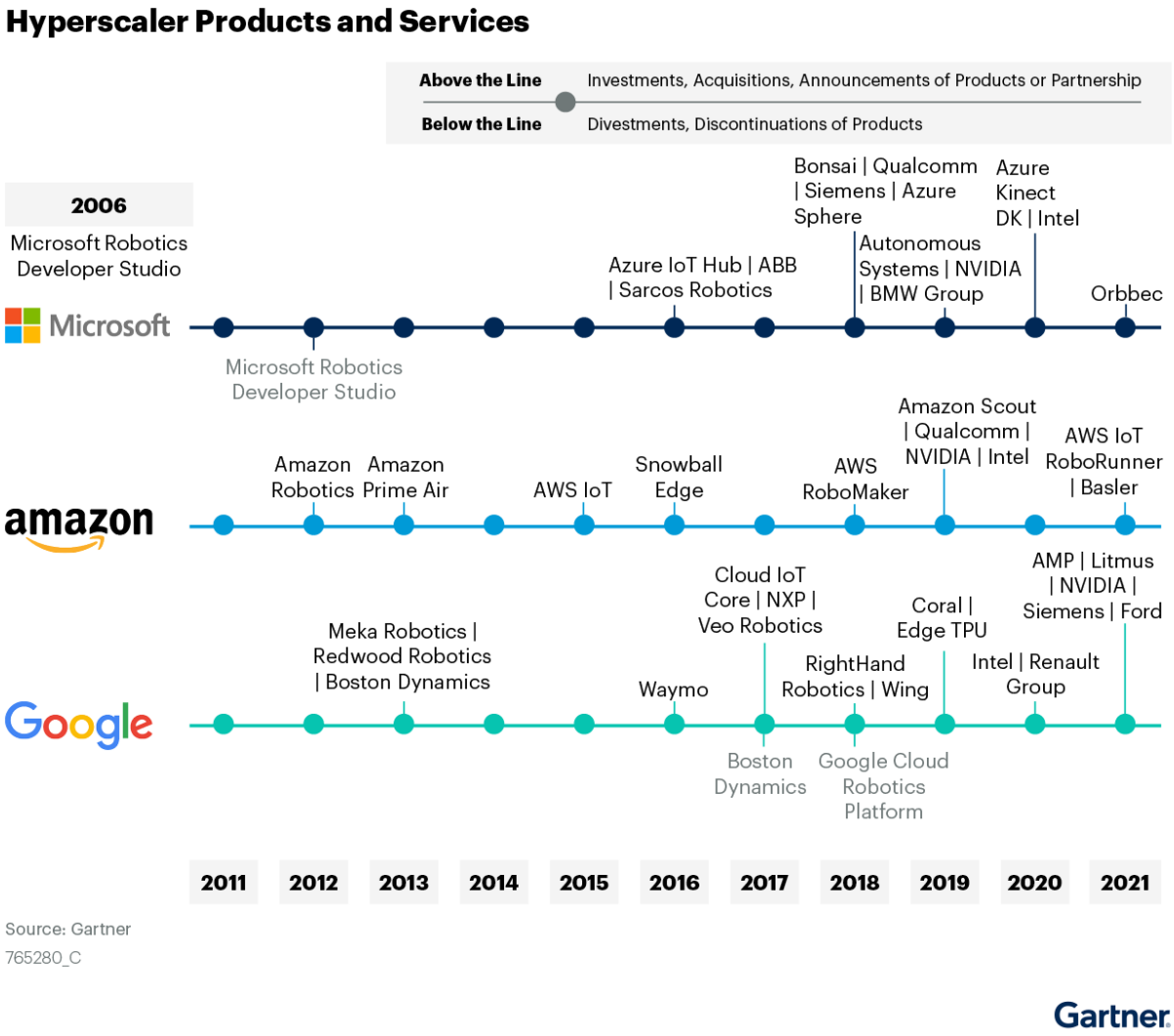
- Demonstrate value by focusing on points in the chain where you can provide a differentiated proposition.
- Create partnerships with vendors capable of providing other components, but avoid exclusive relationships to maintain flexibility as this will be important given the rapidly evolving ecosystem.

Critical Insight: Hyperscaler Companies Are Increasingly Investing in Robot Management Systems

Hyperscalers recognize that robot hardware will become increasingly commoditized, which will shift the focus to the software that manages, controls and optimizes the value of fleets of robots often from different robot vendors. Because of this, over the last five years, Amazon, Google and Microsoft have significantly increased their investment into the robot value chain. This has included acquisitions, partnerships and organic growth through the development of new products and platforms. All three hyperscalers clearly see smart robots, and the management of smart robot fleets, as an important market, and thus will continue to invest in products that provide support for smart robot fleets.

Figure 3 shows how investment and partnerships have accelerated in the last few years. The point here is to show not the products themselves, but rather the rate at which the hyperscalers have built, acquired or partnered to gain presence in the smart robot value chain.

Figure 3: Hyperscaler Products and Services



Near-Term Implications

The hyperscale companies are becoming involved in many parts of the value chain, with the notable exception of hardware (no one wants to make hardware!). Initiatives stretch from on-robot edge computing, such as Azure Sphere, to multiagent orchestration platforms such as AWS IoT RoboRunner. Figure 3 also shows where hyperscalers have retired projects, although these are few and far between. Google's decision to divest itself of Boston Dynamics demonstrates (again) how high-margin technology companies don't want to work in hardware. But there's nothing to indicate that any of the hyperscalers are reducing their interest in smart robots as a whole.

For many vendors, this trend will be concerning — competing with Amazon, Google and/or Microsoft is not to be taken lightly. However, it should be noted that much of this involvement is in the form of partnerships — the hyperscalers are well-aware that they lack the experience, and industry knowledge, to create popular robot platforms without vertical expertise. The customer preference for vendors with industry knowledge (established in Gartner surveys and the CBR project) will ensure that these partnerships remain important.

Recommendations for Product Leaders

- Avoid disruption from hyperscalers by working with them, providing industry expertise and filling parts of the value chain outside their expertise.
- Identify products that may face competition from hyperscalers, and create a brand strategy that includes mitigating that competitive threat in the long term. Don't expect the hyperscalers to lose interest and move on.

Critical Insight: Buyers Care More About Experience in Their Industry Than They Do About Robot Knowledge

The 2021 Gartner Autonomous Robotic Systems Customer Needs Survey was completed in June 2021 and demonstrated that customers selecting a vendor are primarily driven by how much the vendor knows about their specific industry (see Table 2). Potential customers are looking for partners who can advise them on the most effective way to apply smart robots to their business, and that have solutions that fit the needs of their industry.

Table 2: Factors Driving Vendor Selection (in Order of Importance)

Enlarge Table

Factor	Impact
Expertise for scope	Customers want to see case studies showing successful deployments in the same industry, or a closely related industry, to demonstrate the experience and knowledge of the vendor.
Cost-driven decision	Many vendors are adopting a robot-as-a-service (RaaS) offering, although the more expensive the robot, the more likely a hybrid approach is being used.

Reputation	Referrals and recommendations from existing customers are highly valued because the ecosystem is so immature.
Wide capabilities beyond scope	Many customers are planning to start small and scale up later, so they want to work with vendors capable of supporting their future plans.
Number of years in business	The industry still has a lot of startup companies with limited experience, so longevity of business is considered akin to a recommendation and an indication that the company will be around for a while.
Commercial model	Some customers are looking specifically for RaaS, while others will want a purchase model to keep operational expenses low.
Existing relationships	Few companies have established a significant reputation, so existing relationships are highly valued.
End-to-end package	The value chain is still highly fragmented, and some customers are concerned about compatibility and integration challenges.
Legal and contractual terms	For some customers, it is important to maintain flexibility in the face of changing technical capabilities.
Referred by peer	This may be desirable, but it rarely happens in such a nascent industry.

Note: Data is based on the 2021 Gartner Autonomous Robotic Systems Customer Needs Survey from June 2021 (n = 250).

Source: Gartner (May 2022)

The focus on industry experience is consistent with data from the CBR project, which found customer education to be a significant challenge in selling smart robots. Customers are often unaware of how smart robots can be applied to their processes — the range of applications to which they can be put,

and how complex (or simple) they are to deploy. Vendors often have to engage in a significant process of education to ensure that the right robots are purchased and that they're used efficiently.

Near-Term Implications

More than half the companies questioned in our CBR project said that customers had inaccurate expectations of what smart robots could do, and how complex it was to make them do it. These expectations go both ways:

- Customers thought that extensive modeling of the environment would be necessary prior to a single robot being deployed, or that radio beacons would have to be installed.
- But equally, they imagined that the robots would automatically respond to a fire alarm or be able to collaborate with other autonomous systems without additional programming.

Vendors have to play a vital role in educating customers, using simulations and example deployments to explain what's possible from the robots themselves, and the integration that will be needed. Simulations can be extremely helpful in enabling optimization prior to deployment, such as the placement of recharging points or the number of robots needed, and can also rapidly demonstrate the expected ROI. Furthermore, boutique consulting and system integration firms, that focus in other areas of cyber-physical automation, should and will develop practices to help customers navigate the smart robot decision-making process.

Recommendations for Product Leaders

- Demonstrate specialist industry knowledge and experience by providing case studies, example deployments and industry references, rather than focusing on the technical capabilities of your product.
- Provide ROI modeling through customized simulation, ideally providing a graphical demonstration showing how the number of smart robots, and their application, will impact the customer's business.

Conclusion

The robot value chain is still evolving, with vendors, integrators and end users experimenting on where to partner, where to acquire and what to develop in-house. As the market develops, we expect clearer demarcation between software and hardware suppliers, and greater customer understanding of both the capabilities and the business models involved in deploying smart robots. This will make it more important that suppliers focus on areas where they can properly differentiate.

It's already clear that multiple parties will be involved in every smart robot deployment for at least the next five years, and the absence of standards threatens to make such relationships complex. End customers will not tolerate a blame game — vendors trying to exonerate themselves by blaming other parts of the value chain. So a collective responsibility will be necessary if smart robot deployments will be successfully completed.

Evidence

This document presents results and insights from a Gartner CBR project (from November 2021 through January 2022) that explored the smart robotic solution implementations of nearly 200 enterprises and examined the offerings of more than 40 technology providers. Gartner conducted this research to advise product leaders on advancing capabilities for smart robots and smart robotic solutions, identifying the most prominent, most valuable and emerging technologies and use cases. Product leaders should use this information in developing product strategy and making product roadmap decisions.

Note 1: Definitions for Various Smart Robots and Use Cases

Agricultural robot — An AI-enabled robot assisting with activities in agriculture, such as crop picking or weeding

Asset inspection robot — An AI-enabled robot deployed to inspect equipment, facilities and dangerous places for humans

Commercial cleaning robot — An AI-enabled robot fulfilling cleaning or disinfection for inside commercial facilities

Commercial security robot — An AI-enabled robot fulfilling inspections/checks for indoor or outdoor commercial facilities

Educational robot — An AI-enabled robot supporting schools and used in classrooms by students and teachers

Exoskeleton — A wearable device that works together with a human to augment and reinforce human performance and minimize strain and injury by providing lift support, weight dispersion, posture correction and other capabilities

Food robot — An AI-enabled robot making food or assisting with some process of food preparation

Logistic robot — An AI-enabled robot operating inside warehouse or logistic facilities, include last-mile delivery robots

Military robot — An AI-enabled robot deployed by the military to support army activities or deployed alongside human army personnel

Personal robot — An AI-enabled robot designed and created to be used by an individual.

Space robot — An AI-enabled robot operating in Earth’s atmosphere or space

Workplace robot — An AI-enabled robot operating in offices, meeting places and conference/exhibition halls.

*** Attention: research are originally in English and I have translated it into Chinese by Google Translate as instructed by Peter. In case of any discrepancy between the English version and the Chinese version, the English version shall prevail.*