

Artificial Intelligence

When Should a Social Robot Look Human?

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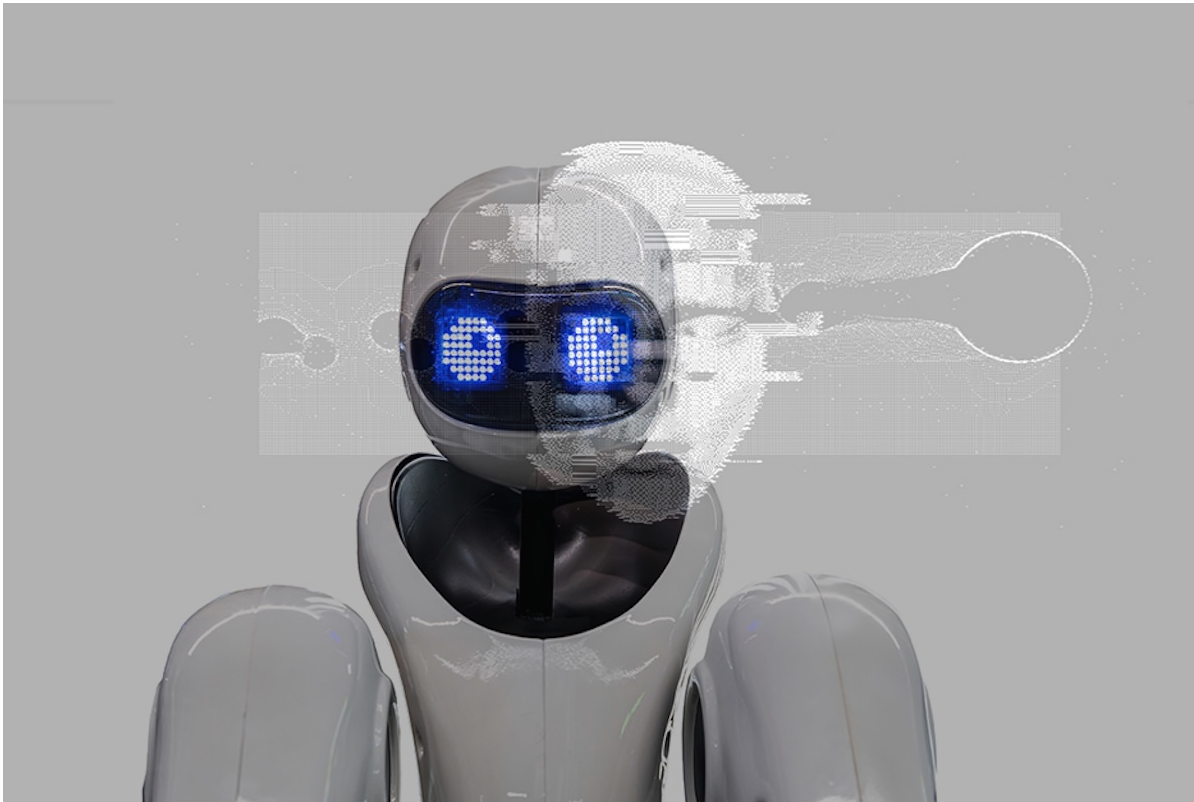


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Successful integration of robots into consumer environments requires thoughtfully matching their form and function.

When Tesla unveiled its Optimus robot at the recent “We Robot” event in California, the audience watched in awe as it danced, joked, and even played charades. Elon Musk confidently claimed Optimus would soon babysit your kids, walk your dog, and serve drinks.¹

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Tesla isn’t alone. Companies like Boston Dynamics and SoftBank are chasing the same vision, and global investment in humanoid social robots is forecast to climb from just \$395 million in 2022 to over \$23 billion by 2032.²

Yet, a vast majority of social robots deployed today look nothing like humans. Consider BellaBot—a waist-high, cartoonish cat delivering food in thousands of restaurants across 60 countries.³

So which form should a company choose? Cost and engineering constraints matter, but our research and others show that an important lever that is often not considered: how customers perceive a robot's role in the room. The adoption of robots depends on aligning their intended social roles and the expectations those roles create. In other words, successful integration of robots into consumer environments requires thoughtfully matching their form and function.

Matching Robot Form with Function

Our research explored how consumers respond to humanoid versus non-humanoid robots performing different types of tasks.⁴ Through three studies spanning Japanese and U.S. consumers, we discovered a pattern: the alignment between a robot's appearance and its function significantly impacts consumer acceptance.

In one study, we asked a professional marketing research firm to conduct surveys on 202 customers who interacted with SoftBank's Pepper—a humanoid robot which conducts tasks at the request of customers—in retail settings. Customers were inclined to use the robot for straightforward, utilitarian help (e.g., product recommendation, seating) with a total of 227 occurrences. In contrast, reported only 5 occurrences for entertainment use cases of Pepper.

In a follow-up experiment, we showed participants either a humanoid robot (Pepper) or a non-humanoid robot (LoweBot) performing a utilitarian task (product advice) or a hedonic task (telling a joke). When the task was **utilitarian**, the humanoid robot generated higher more positive attitudes. In contrast, when the task was **hedonic**, the non-humanoid robot scored higher.

Real-world deployments illustrate these principles in action. For example, the Robot Café in Nairobi uses humanoid robots (named Claire, R24, and Nadia) for the utilitarian task of food delivery.⁵ The combination of their human-like appearance and practical function created what customers described as a “unique” and positive experience, leading a steady stream of curious visitors.

At UCLA Mattel Children's Hospital, the opposite approach works effectively. The Robin robot—deliberately designed with a cartoonish, non-humanoid appearance—provides emotional support to hospitalized children through games, stories, and empathetic responses. In a controlled study, children reported significantly greater comfort and enjoyment with Robin compared to standard video tablets, with 90% of parents welcoming future visits.⁶

Humanoid robots, however, struggle when mismatched with the type of their tasks. During a visit to Pepper Parlor in Tokyo, one of us (Nobuyuki) observed the humanoid Pepper robot responding to the task of telling jokes in a formal setting: “Why couldn't the bicycle stand up by itself? Because it was too tired!” The experience felt forced and out of place, highlighting a broader insight: when humanoid robots attempt entertainment in professional environments, the result often feels even more cringeworthy than charming.

Another factor to consider in robot deployment is the complexity of the tasks. Research suggests that humanoid robots are better suited for complex tasks that require cognitive engagement, such as assisting customers with detailed product information or helping solve service issues.⁷

To help managers think through these decisions, we developed a two-by-two framework that classifies robots along two dimensions: task type (utilitarian vs. hedonic) and task complexity (high vs. low) (See Figure 1). Importantly, what matters most is the perceived complexity, which does not necessarily match objective complexity of a task. A task that seems simple to engineers may still feel complex to customers and vice versa.

Another important deployment consideration is the social context in which the robot will operate.⁸ When people engage in shared consumption experiences—such as dining in groups or attending events—humanoid robots tend to be more effective. Their human-like presence can enhance the social atmosphere and feel more appropriate in group settings.

Clearly all these factors assume use of robots when they function well. Many robot development attempts fail, regardless of how they look, because the robots are not capable of the tasks they are designed to do.

Consider Japan’s Henn-na Hotel, marketed as the world’s first “robot hotel.” The property deployed over 240 robots, ranging from receptionists to lobby entertainers and luggage carriers.⁹ The concept was designed to blend hedonic novelty with utilitarian service automation. But in practice, the robots struggled to meet even basic customer needs. The in-room assistant, for example, couldn’t answer simple questions, and the luggage robots routinely failed to deliver bags correctly. Perhaps most memorably, the dinosaur-themed front desk robot was unable to scan passports due to its oversized claws. Instead of streamlining operations, the robots created more work for staff, who had to step in frequently to assist frustrated guests. Within a few years, the hotel had “fired” more than half its robot workforce.¹⁰

		Task Type	
		Utilitarian	Hedonic
Task Complexity	High	Humanoid Robots are ideal: The Neo Beta humanoid robot by 1X Technologies adeptly handles complex culinary tasks like cooking steak and effectively “to navigate complex tasks” in the kitchen. ¹¹	Neither is ideal Either humanoid or non-humanoid robots can work. The H1 humanoid robot by Unitree demonstrates complex dance moves with human dancers. ¹²
	Low	Humanoid Robots are ideal: The Eve non-humanoid robot by Halodi Robotics demonstrates success in straightforward domestic chores like folding laundry. ¹³	Non-humanoid robots are ideal: The BellaBot non-humanoid robot by Pudu Robotics thrives by delivering dishes and singing songs in restaurants. ¹⁴

Figure 1: The Robot Typology Matrix

But research suggests that humanoid robots may be better equipped to recover from service failures, as customers appear more forgiving when the apology or corrective action comes from a robot with human-like traits.¹⁵ If your service environment has a high likelihood of errors or disruptions, a humanoid form could help soften the impact and maintain customer satisfaction.

The Future Is a Team Effort: Designing Robot Ecosystems

The choice between humanoid and non-humanoid robots is not binary or static. Effective deployment depends on a combination of factors: the type and complexity of the task, the customer's context (such as dining alone versus in a group), and even the robot's ability to respond during service failures. Developers and managers must move beyond surface appearance to consider the deeper functional and situational factors that shape customer experience.

A forward-thinking approach envisions a more dynamic, multi-robot ecosystem. Imagine a next-generation robot café, similar to Tokyo's Pepper Parlor. In this café, a range of robots work together to create a seamless experience. Some non-humanoid ones focus on hedonic tasks, such as greeting customers with playful interactions or hosting trivia games at the table. Other humanoid ones take on more utilitarian roles—delivering food, answering menu questions, or even handling feedback and complaints.

Over time, these roles could be refined through data. A robot's deployment could be customized based on a customer's previous visits—whether they tend to enjoy playful robots or prefer quick, efficient service. Real-time inputs like whether a customer is alone or part of a group could shape which robot is sent over. In short, robot design and deployment could become as dynamic as the customer journeys they are part of.

Such a vision is becoming increasingly achievable with platforms like NVIDIA's recently launched Isaac GR00T N1—an open-source robot foundation model.¹⁶ The platform democratizes robot development by providing pre-trained models and simulation frameworks that can significantly accelerate the design and deployment of contextually appropriate robots. The technological barriers to implementing nuanced, multi-robot environments are rapidly falling.

All in all, the future of social robots is about building systems where different robot types complement one another—each deployed where it performs best. Getting there will require not only technical innovation but also deep behavioral insight and ongoing

experimentation. For companies willing to design with that nuance in mind, the result will be something more than novelty: a truly elevated customer experience.

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