Where Are They? The Absence of Social Robots in Real-World Environments

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Abstract

The field of human-robot interaction frequently proclaims the inevitable coming of the social robot era, with claims that social robots are increasingly being deployed in the real world. However, in practice, social robots remain scarce in everyday environments. In addition, HRI research rarely explores robots through an organisational lens. This results in a lack of evidence-based understanding of the organisational conditions that are key to the presence–or absence–of social robots in the real world, which are often more decisive than technical sophistication. In this paper, we motivate why organisational context is crucial to the investigation of real-world social robots and provide examples of how this shapes robot acceptance. We detail the methodology of our ongoing empirical research with client organisations and robot developers. Through this critical organisational lens, we learn where social robots are, what they are doing, how they are designed, and why organisations are deploying them.

CCS Concepts

• **Applied computing** → **Business-IT alignment**; • **Computer systems organization** → **Robotics**; • **Social and professional topics** → **Socio-technical systems**.

Keywords

design theory, human-robot interaction, stakeholder theory, organisational theory

Figure 1: Retail shop advertisement: "I am the very first robot shop assistant in the Netherlands", taken November 2025

1 Introduction

It is frequently claimed that social robots are increasingly being deployed in the real world [15], yet in practice, outside of controlled studies, social robots are remarkably scarce. As Zawieska [45] argues, they remain largely absent from daily environments despite years of optimism.

Where real-world deployments of social robots generally occur is not in private homes, but within organisations: retail shops [16], airports [21], restaurants [24], hotels [34], museums [18], and hospitals [39]. The success of these deployments depends not only on the technical capabilities of the robot, but also on features of the target organisation, including goals, workflows, brand identity, labour dynamics, values, and risk tolerance.

In research, social robots are rarely examined through this organisational lens. Robots are typically studied as interactional artefacts, with an underlying assumption that if a system is engaging, socially appropriate, or able to provide natural interactions, organisations will consequently adopt it. Our preliminary fieldwork suggests

Figure 2: Pepper robot non-operational in retail environment, Tokyo, Japan, photograph taken December 2024

the opposite: organisational conditions, not interactional quality, largely determine whether robots exist in the world at all.

In Figure 1, we can see a shop advertising that their robot is "the very first robot shop assistant in the Netherlands." Yet, when we entered the shop and visited every aisle, we could not find the robot. When we informally asked front-line workers in the shop where the robot was, we were told the robot was not currently operational: they were having problems with it, it required updates, but would hopefully be back before the end of the year. In other cases, robots may be physically present within a space but powered off: non-operational, non-functional, and with their core functionality even replaced by other technology (see Figure 2).

However, when looking at the manufacturers of these robots this reality is not immediately reflected; recent robotics startups have had unprecedented investment and substantial media interest. 1X, manufacturer of the Neo robot, has recently stated they are hoping to raise $1 billion in their latest funding round [22], which would value the company at $10 billion, firmly in the region of technology giants like Asus and Lenovo. Tesla shareholders recently approved a pay package worth $1 trillion for CEO Elon Musk, contingent in part on the delivery of one million Optimus robots [5]. Yet, when we look at that state of many past social robotics companies, we do not find the same optimism. Mayfield Robotics, creators of the Kuri social robot, ceased operations in 2018 [23]. Rethink Robotics, creator of Sawyer and Baxter, also ceased operations the same year, despite raising almost $150 million dollars of funding in its 10 year history [28]. Anki, creator of the Vector robot, shut its doors in 2019 [41]. Jibo, a home companion robot created as a spin-off from

MIT, alongside Embodied Robotics, the developer of Moxie, both went into bankruptcy in 2024 [3, 14]. Even Aldebaran Robotics, the manufacturer of Pepper, arguably the most famous social robot, ended production of Pepper in June 2021 [4] before going into receivership in 2025 [29].

We can see that in both research and industry that there is unfounded optimism about the *promise* of social robotics. We argue that one major reason for this optimism, and the gap between expectations and real-world outcomes, is that HRI research often studies robots primarily as stand-alone interactional artefacts, rather than as technologies embedded within complex organisational systems. Organisations often drive the adoption, normalisation, and long-term sustainability of many technologies. Their values, identities, workflows, and risk perceptions shape not only whether robots are introduced, but how they are integrated, repurposed, or ultimately abandoned.

This research therefore challenges the *techno-optimism* perpetuated by investors and presented by researchers by investigating social robots through a critical, organisational lens. We focus on understanding why organisations choose to acquire robots, how robots are actually deployed, what expectations staff hold and whether they are met, and how these deployments differ from the assumptions and prototypes prevalent within academic HRI.

2 Research Aims

Our participants are organisations that have purchased or piloted robots to undertake functions within their workflows, and engineering and consultancy firms who design and sell robots to these organisations. This two-fold approach allows us to understand what motivates and drives organisations to acquire robots, how values shape deployment, what staff expectations of the robot were and if they were met, and ultimately how they were integrated. It also will allow us to explore how the priorities of academic research in HRI differ from the practicalities of commercial development, and therefore understand how we can begin to bridge this gap as a field.

3 Why Organisations Matter

Customer-facing organisations often require several high-contact systems [11], in which customers interact with workers to complete their goal, such as making purchasing decisions or finding their way. These are primarily short-term and episodic interactions; "fleeting encounter[s]" [9] which follow, as Goffman [20] explored, tacit social norms. However, even brief interactions are influenced by the surrounding environment and its embedded expectations. The spatial context can also affect the goals and interactions that are undertaken there; people often have a different relationship with a space where they are actively encouraged to spend money [2] and/or are time pressured [26, 40].

Robot introduction within spaces such as factories has traditionally been seen through a lens of cost-benefit analysis, with efficiency and throughput being the main factors for adoption [8]. However, when designing social robots for use in high-contact roles [11], other factors can be at play [17] such as the organisational identity of a company, defined as the central, distinguishing and enduring attributes of a company [42] which shape how an organisation acts and makes decisions on how they operate. These collective

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HRI Companion '26, March 16–19, 2026, Edinburgh, Scotland, UK

attributes have been shown to affect willingness or resistance to change [27]. Non-monetary values and social benefits present a complex challenge when attempting to integrate social robots into workflows, from both a worker and customer perspective.

Robots can also be used as a powerful organisational signal by companies, commonly used to signal modernity or luxury in an attempt to boost an organisation's image. However, a robot can also harm organisational reputation if consumers or clients deem that it does not fit the brand personality; for example, Choi et al. [12] found that high-contact robots engendered negative reactions when deployed in the context of brands with a sincere rather than exciting personality. Similarly, intra-organisational tensions can arise surrounding failed use-cases of robots; in one case, "hiding" them within storage cupboards was seen as the solution to financial tensions [6], where employees raised issue with money being spent on non-functioning robots while their salaries were frozen.

In wider society, organisations are a significant driver of technology adoption and often can incentivize the use of new technologies. Retail stores implementing self-checkouts promised quicker service times and more convenience to consumers, helping their acceptance [1]. Businesses convince consumers to download apps to their mobile phones by offering discounts on products on services, and in turn this allows consumers to be reached continuously almost free of charge via push notifications [38]. Some organisations take this even further by requiring the use of the technology in order to use their services. For example, companies may mandate RFID access cards for employees to be able to access workplaces, while students are required to use universities' learning management systems in order to submit their coursework and access course materials. The media company Netflix, moved from physically posting media content to their customers to an online-only model, saving costs but excluding non-digital populations [37].

Similarly, in the context of social robots, the organisations in which they are deployed play a crucial role in driving the way robot technology is deployed and diffused. Social robots are expensive, and most people's first exposure to a robot will be when they experience it deployed within an organisation's space, or through helping to design and integrate a robot in their role as an employee within an organisation. Many preconceptions of robots are shaped by science fiction [30], which can result in a mismatch between a realistic expectation of how they may behave and a utopian, techno-optimist expectation of interacting with a humanoid robot of the type represented within media.

This positions organisations as the primary gatekeepers of real-world robotic experiences: they decide which robots appear, how they are used, what roles they perform, and what meanings become attached to them. Consequently, user expectations of what social robots "are" and the tasks they undertake are shaped not by everyday domestic use but by organisational choices, constraints and performances.

These dynamics make organisations a crucial site for studying the real-world trajectories of social robots. Understanding why organisations choose to acquire robots, how they frame their purpose, and how these robots actually function *in situ* becomes essential for explaining both the presence and the conspicuous absence of robots in everyday environments.

4 Why Interaction Is Not the Only Answer

Much HRI research has explored social robots as interactional actors. This approach has produced significant work on basic interactive factors such as embodiment, linguistic politeness strategies, gesture generation, and turn-taking. However, this perspective is only part of the story. It is also important to understand the organisational factors that affect the success criteria, and ultimately the adoption, of social robots into real-world environments.

This can be illustrated through a hypothetical example of how organisational factors can override interactional factors in end-user responses to a robot. Consider a robot programmed with knowledge only of a subset of products within a shop, for example only the household appliances section of an electronics retailer. If a customer has queries about products outside of this subset, this would have a marked effect on the acceptance from the customer, as the response deviates from their mental model of what would be reasonably expected of a system or a worker within the store. This failure is not contingent on the basic aspects of the conversational interaction, such as tone, response time, or physical design; rather, it is primarily a data acquisition problem. However, the customer would associate this robot with "incompetence," with possible negative effects on their perception of not only the robot but also the organisation as a whole.

Diffusion of Innovations [32] is a popular theory to explain how and why new ideas and technologies spread. Two core concepts in this theory are *relative advantage*, the degree to which an innovation is seen to be better than the status quo, and *trialability*, the degree to which the innovation supports experimentation on a limited basis. While traditionally these factors have been considered at the level of interactions, they can also be applied at an organisational level. The robot needs to provide a relative advantage for the organisation in one of several ways: it needs to reduce the burden on staff, improve the customer experience, provide a positive organisational signal or otherwise convey a positive brand image.

This relative advantage can often be an issue when considering the mismatch in goals between organisations and research-led robot interventions. Often, robots are deployed in tasks that are adjacent to the crucial, sometimes profit-driven, workflows that underpin the organisation, increasing the trialability of the robot system. Consider the example of a robot deployed within a railway station [31]. The robot was able to give accurate train timing information; however, customers were unable to purchase a ticket from it. If the customer perceives the robot as a "worker" within the station, the fact the robot cannot then sell them a ticket for the train is a relative *dis*advantage compared to human workers or electronic machines. However, by not integrating the complex ecosystem of payments, the risk is reduced substantially and the velocity of the development and deployment increased, but at the expense of the practical usefulness of the robot.

More broadly, these two factors highlight how the success of robots depend on an organisation's infrastructure. Robots deployed within hospitals or offices for navigation tasks are often limited to certain areas. This is not strictly because of safety concerns or sensitivity, but often rather because integration with the automatic door access is not possible for the robot, or is prohibitively expensive for a research pilot or even commercial budget.

Intra-organisational resistance is also a factor. Robotics projects are often met with criticism from front-line workers, as the project may be perceived as a threat to their job security or may invite unwanted job transformations. Stakeholders can often feel excluded from the design and integration of the robot [25], or find that their workload actually increases as a result of the robot's introduction [43]. Efforts to include co-design within HRI research are designed to mitigate this issue; some researchers have included front-line workers in HRI design [19], and a research workshop series on worker-robot relations has been held since 2024 [44].

Ultimately, this work raises a broader question: are social robot researchers trying to find the nail for the hammer, and is there actually other technology that would suit the target problem spaces better? There is a case for misalignment if robots are considered as stand-alone interactional artefacts, even though the technology is impressive in itself. When cost-benefit analysis is brought into the picture for long-term adoption of social robots, it may be found that the non-monetary benefits do not outweigh the perceived novelty and innovativeness.

Recognising this gap between studying robots as interactional artefacts and organisational realities can help to elevate HRI research and support future successful real-world deployments. Organisations are not passive sites for robot use; they actively shape what robots become, how they are deployed, and whether they truly integrate into their environment. But to understand this factor fully, HRI researchers must engage with these organisations to understand their constraints and decision-making processes.

5 Methodology

To address the identified issues, we are employing a qualitative multi-method approach combining semi-structured interviews with stakeholders and ethnographic observations of the robots operating in their environments.

5.1 Organisation Identification and Recruitment

We used a mixed approach of both purposive and snowball sampling to identify and recruit participants from within organisations where robots are currently used or have operated in the past.

Firstly, purposive sampling was used to identify organisations where robots have been deployed. This was achieved through conducting online searches for variations of "robot netherlands" to gather news articles, press releases and other media surrounding deployments of robots. We then utilised snowball sampling to further extend this list of organisations. We reached out to our professional network of researchers from universities across the Netherlands asking if they were aware of any commercial robot deployments. We also posted on local groups on social media platforms asking if users had encountered any robots within their city or country.

This enabled us to compile a list of organisations to approach. We reached out via e-mail to ask if they or their employees would be willing to participate in our research study.

5.2 Interviews

Semi-structured interviews are being conducted with participants. Interviews last approximately one hour and take place either in-person at the participants' organisation or online via Microsoft Teams. No payments are made for participation in the research study, which has received ethical permission from our university.

The interview questions are based on five main topics. 1) The interviewee's job role, such that we can understand the perspective the following questions were answered from; 2) the values and identity of the organisation, and that of the people who work there; 3) how the robot was acquired, and how the tasks were selected and developed; 4) how the robot performed and the success of the deployment itself; and finally 5) lessons learned and future ambitions for robotic projects.

5.3 Ethnographical Observations

To further our data collection, we are conducting observations of robots *in situ* to understand how they operate and integrate within an organisational environment.

Ethnography has long been used by anthropologists to understand environments [35, 36]. In recent years, this methodology has gained popularity within HRI as an effective method for studying robots outside of laboratory environments [7, 13]. However, it is also used in organisational studies [10, 33]. Moving away from purely interactional factors, organisational ethnography emphasises workflows, spatial arrangements, materials and culture and their contributions to an organisation's attributes.

For the observation studies, a researcher is present within the same environment as the robot is operating. This immersive approach allows us to understand the atmosphere, how the robot is utilised within workflows, and how the context influences its operation. For privacy of the workers and customers within the space, no video recordings are taken, and only field notes are used.

6 Conclusion

To begin to realise the dream of widespread social robots in the real-world, we must look beyond interactional factors and examine the organisational factors and environments in which robots must operate. Organisations, through their values, workflows and infrastructure, actively shape whether robots are deployed, what tasks they undertake, and ultimately whether they persist. Sophisticated interactions are not enough: even technically capable robots can fail if they are misaligned with organisational or practical constraints. To investigate this, we are conducting semi-structured interviews with client organisations who have deployed robots and with companies who actively build robot solutions, complemented by organisational ethnographic fieldwork. By foregrounding this critical organisational lens, challenging the techno-optimism prevalent in human-robot interaction, this work-in-progress research will contribute to the field of human-robot interaction by revealing hidden factors behind social robots in practice. Ultimately, our goal is to provide insights to help bridge the gap between HRI research and practice, informing more effective integration of social robots that are aligned to the complex realities of the organisational environments they must operate in.

Where Are They? The Absence of Social Robots in Real-World Environments

HRI Companion '26, March 16–19, 2026, Edinburgh, Scotland, UK

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