

Social Robots in Organizational Contexts: The Role of Culture and Future Research Need



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Abstract

The integration of social robots in organizations is on the rise. In the future, an increase in the application of physically embodied robots who socially interact and collaborate with humans is expected. The successful integration of social robots in organizations requires a cultural fit between values embedded in social robots and values lived in the organizational context in which the robot is deployed. A new generation of robots has emerged. Unlike conventional industrial robots that perform repetitive tasks in a delimited area in factories, this relatively new type of robot is characterized by sociality, which means that it has the ability to express emotions, communicate, and learn from other agents. Compared to industrial robots, social robots no longer function as mere “machines” that perform some predefined tasks such as assembling car parts. They are able to cooperate and interact autonomously with human partners to achieve mutual goals based on their cognitive abilities.

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A variety of application areas for social robots is currently evolving. For example, social robots may assist patients in “checking in” at the doctors, support customers in hotel lobbies, or they can help students with their learning activities. This new kind of interaction with robots comes with challenges such as the integration of social robots in existing organizational contexts. This integration has to be tailored to the specific needs of each organization and be aligned with the organizational culture, so that the social robot can unfold its potential and contribute to increased organizational performance.

Particularly, the integration of social robots into organizational cultures, i.e. the acceptance among employees to interact with the social robot, will play a key role in social robot adoption. Social robots will increasingly collaborate with humans in the workplace, where they will take over autonomous roles in work processes. Hence, social robots will be part of the organizational culture and both human and robot behavior will mutually shape each other. Thus, the concept of culture is an essential research field in robot design and robot integration in organizations.

SOCIAL ROBOTS IN ORGANIZATIONAL CONTEXTS

Over the past two decades, several attempts have been made to define the concept of a social robot. A review of definitions of social robots reveals that a variety of facets have been taken into account. Scholars from the field have not reached consensus on the typology of social robots. Social robots are generally understood as machines, applications, or autonomous agents. Although the ability of social interaction is considered the main function of a social robot, some researchers also explicitly mention other functional skills such as task execution, assistance, and problem solving. Furthermore, beyond the interaction with humans, other researchers additionally include the interaction with the environment or other robots as one of the qualification criteria of a social robot. Moreover, research has defined various attributes that characterize a social robot. While most definitions emphasize sociality and communicativeness, for some researchers, the physical embodiment or the possession of cognitive functions are very important elements of a social robot.

The term social robot is often used synonymously with service robots. Unarguably, there is an overlap of the capabilities between social robots and service robots, which are robots that perform “useful tasks for humans”. Both might be partially autonomous, possess some sort of cognitive functions, and carry out social interactions with their counterpart such as avoidance of collisions, communication through audio, visual, and written signals, collaboration in assembly tasks, etc.

To distinguish social robots from service robots, we suggest using the characteristics and the extent of social interactions of their main task as indicators. While the main task of a service robot is to perform a certain activity that physically supports humans, such as lifting, assembling, or cleaning, the main task of a social robot is to interact socially with people, for example through having a conversation, playing a game, answering questions, providing guidance, or engaging in learning activities. Despite these differences, however, we can expect that the capabilities of social and service robots become increasingly aligned over time. Even today, we can already identify robots that integrate both physical and verbal interaction with humans.

ORGANIZATIONAL APPLICATION AREAS OF SOCIAL ROBOTS

The ability to interact socially with the user and engage with the user on an emotional level opens up new possibilities for the application of social robots in organizations. In the domains of healthcare, education, and tourism, the use of social robots has been intensively studied. The following sections give an overview of these application areas:

1. Healthcare - Several trends drive the use of social robots in healthcare: On the one hand, the demand for care has been increasing due to the globally ageing population and the rising prevalence of people with disabilities. On the other hand, the cost of care has continuously grown while the shortage of healthcare professionals is still considerable. Social robots find a broad range of applications in healthcare. Research has mostly focused on two target groups: elderly people and children. When it comes to elderly people, researchers have investigated the use of social robots for various application scenarios, such as the treatment of mental health, promotion of psychological well-being, support of physiotherapy and companionship. Research targeting children has mostly focused on involving social robots in the treatment of autistic spectrum disorder, in which a social robot can take on various roles to achieve the therapeutic goals. In addition, social robots are used in health elucidation (e.g. quizzes on diabetes knowledge) and well-being (e.g. distraction during vaccination) of children.

2. Education - A further popular application domain of social robots is education. In this context, social robots can take on the role of a teacher, teaching assistant, novice, companion, and peer. Most research is aimed at children and the education of adolescents. Language learning and teaching is increasingly using social robots. A meta-review showed that social robots were predominantly involved in vocabulary learning. However, a few studies also reported how robots can help improve reading skills, grammar learning, and sign language. In further application scenarios, social robots acted, for example, as teaching assistants to support learning activities in small groups.

3. Tourism - A growing number of research has investigated the use of robots in tourism including organizations such as hotels, museums, and shopping malls, where social robots often play the role of an information provider. In the hospitality and catering sector, the robot is preferably seen as a receptionist and concierge, performing tasks related to logistics and goods delivery, taking customer orders, providing information, and processing payments. Furthermore, from the hotel manager's perspective, registering guests for breakfast, connecting the guest to the hotel desk via video conference, and guiding the guests to the desired location are considered useful applications.

Additionally, application scenarios in shopping malls are similar to hospitality, with a primary focus on information provision, guidance, and entertainment. Social robots also have the potential to be used at the airport to accompany passengers during their flight transfer. Many application scenarios for social robots are still in a research and testing phase and scholars are working intensively on the technical realization and improvement of the use of social robots. However, studies have also shown that the integration of social robots in given contexts is also culturally challenging, since people do not necessarily accept social robots as interaction partners, especially in tasks that require intensive relationship building (e.g., in education or healthcare).

CULTURE AS A CONCEPT IN SOCIAL ROBOT RESEARCH

Culture is a concept that is difficult to grasp and researchers have defined it in many different ways. Basically, many researchers agree that the essential elements that define culture are values,

which are concepts of the desirable—in other terms, what a group deems proper to want or pursue. For example, a group may appreciate the value reliability and, thus, act accordingly through being there for each other, or a group may appreciate the value individualism and find it preferable that everyone can do as they like. This specification leads to another important aspect of culture: the concept always refers to a certain social system, be it a group of friends, an organization or a geographical region. Researchers refer to this lens as levels of culture, such as national culture, professional culture, organizational culture, and group culture.

Considering these specifications of culture, organizations have to understand which cultural levels and associated values are already in place or are required for a successful integration of technologies. As culture has a strong influence on (work) behavior and thus on organizational performance, it should also be considered as an important factor in social robot research.

CULTURE AS PART OF SOCIAL ROBOT STUDIES

Little research is addressing cultural aspects of social robots and human-robot collaboration because the vast majority of robotics studies come from the fields of engineering and computer sciences and focus on technological robot development and performance. When robotics studies investigate culture, they mainly focus on differences in national culture to optimize the functionalities and design of robots. Next, a brief overview of the study of culture in relation to robots in the three organizational application areas described above will be given:

1. Healthcare - Only a few robotics studies focus on the concept of culture in healthcare, even though cultural competence is essential in this context. A robot should adapt to the specific cultural context in which it assists people, such as healthcare workers, elderly people in domestic environments, or patients in hospitals. Especially patients and the elderly in need of care are in a vulnerable state and deployed care robots should represent the cultural values that are needed in this context. Further, a person's attitude towards health and self-care strongly depends on their cultural background - another cultural aspect social robot designers should take into account. The few culture-related studies of robots in healthcare either address the implementation of surgical robots in different national cultures, or they focus on how people perceive and interact with robots at a national or cross-national level in different application scenarios. These studies identify the cultural competence of robots as highly relevant for their application in healthcare and acknowledge cultural differences with regard to the investigated concepts. However, these studies mostly address cultural values in relation to national culture and do not examine further cultural layers that predominate in healthcare, such as organizational values and patient values.

2. Education - There is also little research on the cultural requirements of social robot implementation in education or the cultural values embedded in educational robots. Few studies on robots in the education sector, focusing on culture, investigate either attitudes towards robots or user acceptance as well as child-robot interaction across national cultures. Some studies investigate the difference between Eastern and Western cultures and their openness and willingness to use robots in educational contexts. The underlying assumption is that culture has a

strong influence on the acceptance and use of robots, as confirmed by these studies. Overall, most research conducted on social robots in education focuses on identifying and evaluating learning scenarios and applications without highlighting the culture or underlying values.

3. Tourism - With regard to tourism, some studies on robots focus on their integration into museums to innovate cultural heritage. Further research investigates the cultural differences in attitudes towards robots in Eastern and Western national cultures. Some researchers examine for example the national evolution of robot culture in Japan. Ideas for robot applications in tourism are manifold, however, the concept of culture is not yet being studied intensely at many levels other than national culture. Regardless of the application scenario, the consideration of cultural values is essential to successfully integrate social robots into organizations together with an appropriate design of these robots and the respective human-robot interactions.

Lack of Focus on Culture in Social Robot Research - Overall research on social robots hardly focuses on organizational culture, even though existing studies and conceptual research emphasize its importance. Nevertheless, we can identify a strong need for research that addresses not only the national, but all different levels of culture, and considers cultural values that should be embedded in social robots for their successful integration in organizations. In fact, not only the strategies and goals of an organization determine the success or failure of technology integration, but also the acceptance of the users who determine whether the integration of an artefact into the work routines makes sense.

THE ROLE OF CULTURE IN INTEGRATING SOCIAL ROBOTS IN ORGANIZATIONS

The integration of robots in organizations influences organizational structures and workflows as well as roles and responsibilities. Following prior research on the implementation of novel approaches in organizations, they have to understand their cultural readiness for the integration of social robots in order to design a work environment that enables meaningful human-robot collaboration. In other words, organizations are aware of which of their cultural values support or hinder the implementation of social robots. Research has called for a value-sensitive focus on social robots. Particularly, the value-sensitive design approach has become popular in recent years. It emphasizes the need to integrate human values in technology through a bottom-up approach. Accordingly, the focus should be on the type of values to consider for the cultural integration of social robots into organizational contexts.

Conceptualization - Regarding the cultural integration of social robots into organizations, there are two key sets of values based on previous research. First of all, we need to consider the organizational culture through the values that employees live by in the organization. In other words, we need to have a good understanding of how far the organizational culture supports the integration of social robots or how far the given culture needs to be influenced so that social robots

can actually support the organizational performance. Second, we need to consider the values that are embedded in the specific social robot that an organization intends to integrate. Examples for such values could be fun, modesty, control, and companionship.

The overlap of these two types of values (organizational values and social robot values) is what we call the cultural fit. A high cultural fit exists when the organizational culture embraces values that are also embedded in social robots. A low cultural fit means that the social robot values oppose the organizational culture. In the latter case, cultural resistance regarding the application of the social robot can be expected.

Accordingly, a cultural fit between the values embedded in social robots and the values lived in the organizational context has a positive influence on social robot performance, i.e. the degree to which the social robot supports the organization in achieving its goals. More specifically, we argue that social robots which culturally fit the organization provide the organization with performance benefits such as more efficient and effective business processes. For example, social robots may provide information more quickly, more accurately, and more cost-efficiently than employees. Such performance benefits can be called social robot performance.

CONCLUSIONS

A better understanding of the cultural requirements to successfully integrate social robots into organizations will help practitioners to achieve more powerful performance benefits through the usage of social robots, it will help robot designers develop social robots with integrated cultural values, and it will help employees and customers to see social robots as part of their cultural groups.

Regarding organizational values, future research could examine which values have a positive effect on the integration of social robots in organizations. **For example, based on a survey, researchers could analyze what kind of organizational values support the integration of a social robot among employees. Furthermore, a scale/measurement instrument could be developed to examine the cultural readiness of an organization to integrate social robots.** Such a scale could measure how far an organizational culture already embraces those values embedded in a particular social robot to anticipate potential difficulties and required cultural changes for a successful social robot implementation. Regarding social robot performance, future research may also develop a scale to measure the performance of social robots. This scale could assess how far the social robot contributes to the efficiency and effectiveness of organizational processes (e.g., what factors determine efficient and effective processes supported by a social robot, and how can we measure them?). Finally, researchers could examine what kind of cultural contexts support the performance of social robots the most. A survey could be used that builds on the developed scale for social robot performance and on an assessment of the organizational culture.

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