ORGANISATIE

A robot as your colleague?

What it takes to integrate a robot into the workplace

Robots are promised to be more precise, safer, and more efficient than the best employee is. Moreover: they never get tired. No wonder that organizations increasingly show interest to implement robots. In 2017, sales of industrial robots (mainly used in car manufacturing) increased by 30 percent (IFR, 2018a) and sales of professional service robots (e.g., military or medical robots) increased by 85 percent (IFR, 2018b). However, scientific knowledge of the effects of implementing a robot in organizations is still scarce. Many robots in organizations are not yet as useful as they are portrayed in popular media.

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Since their introduction in the sixties, industrial robots have been most influential in the field of work. Yet many of us would rather categorize them as 'factory machines' than what we now would call a 'robot,' as this first generation of industrial robots was not mobile, autonomous, or interactive in any way. For safety reasons, these large and heavy machines have worked separately from workers in a cage, which only authorized workers could enter. Rapid technological advancements and reduced production costs, however, will further increase the appearance of a new generation of robots in the workplace. In 2022, machines are expected to perform about 42 percent of all current tasks in the workplace, compared to only 29 percent to date (WEF, 2019). In industrial settings, cobots (short for 'co-working robots') are increasingly being used as they are safe, reprogrammable without knowledge of coding, and easy to move. These robots support workers in completing assembly tasks and take on the heavy lifting and tedious tasks that often lead to muscle strain and chronic back complaints. In non-industrial settings, professional service robots are making their way into hospitals, schools, and hotels. These robots can perform non-routine labor of the physical, cognitive, and even emotional kind. Some of these robots fulfil social tasks and are designed to interact with people (for example, a robot that guides people to check-in at airports or teaches children a second language in schools), while others are typically intended to automate dangerous or laborious tasks (for example, a cleaning robot). When compared to the traditional industrial robots, the impact of these new types of (social) robots on the world of work may currently still be limited but is believed to increase soon. This article describes several factors that may facilitate or impede the introduction and acceptance of robots in the workplace.

Fears about robots stealing our jobs

Businesses increasingly choose to automate processes by using robots, as they are believed to make our society more efficient, productive, and safe (IFR, 2017). Despite such positive views, it is also prominently envisioned that a future robotic society will result in major job loss. The forecasts differ on how swift and dramatic the impact of robots on our jobs will be. For example, while Frey and Osborne (2013) predicted that 47 percent of US jobs are at high risk for automation in the upcoming decades, Arntz, Gregory, and Zierahn (2016) suggest that only 9 percent of jobs in OECD countries could be automated. When considering all the reports, no one seems to be on the same page. We should keep in mind, though, that not the technology itself is possibly stealing our jobs. Rather, there are factors – such as the price of labor or the nature of the task – that influence the likelihood that robots will replace employees. In many cases today, it is simply still cheaper to hire an employee than to buy a robot. In addition, we will not always allow robots to replace humans. While it may already be technologically possible to fully automate a task, the public perception is often the last obstacle to tackle (Fleming, 2019). Especially in tasks that involve our health (e.g., diagnosing a patient), emotions (e.g., dealing with customer complaints), or are surrounded by safety concerns (e.g., flying an airplane), many of us rather trust a living person than a robot.

In general, though, several experts also agree that robots, AI, and automatization are likely to change especially routine and semi-routine manual and cognitive jobs. Jobs often mentioned to be at stake are accountants, waiters, drivers, and lawyers. Noteworthy is that even these jobs consist of many different tasks. For most jobs, (social) robots will most likely only assist

us in some of these tasks – as cobots already do in factories.

So how can organizations prepare their employees for the integration of robots in the workspace? While we cannot predict the future, for organizations, it seems to be important to take fears about changes in the nature of work and job loss – whether these fears may be legit or not – in mind when introducing a robot. As with any other organizational change, a dialogue providing reasons to implement a robot including possible consequences is a first crucial step for successful integration into the workplace. However, there are more steps to take.

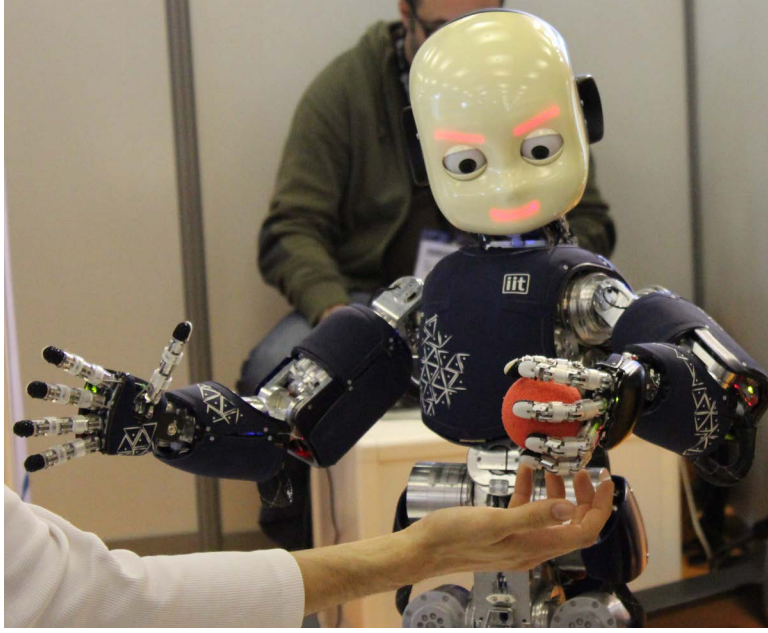

Figure 1. The iCub social robot is designed to look like a 3,5 year old child and can interact with its surroundings (Xavier Care Wikimedia Commons CC-BY-SA).

Preparing employees for the arrival of robots

Although the rise of robots in the workplace seems inevitable, an increasing presence of robots in the workplace does not automatically result in the gradual acceptance of these machines by employees. Technology acceptance is a long-term process (De Graaf, Ben Allouch & Van Dijk, 2018). In the case of robots, this process starts with the employee anticipating its use. Anticipation constitutes a need to seek information about what it means to use or interact with a robot on an average workday while relating its potential use to other similar technology in use. Once being introduced to a robot co-worker, employees still need to decide to actually use it in their daily practices. The initial use period involves some trial and error to adapt the use of such a robot to one's personal needs and routines. Finally, and ideally for organizations, the acceptance process ends with the employee incorporating the use of the cobot into the daily work routines to the extent it exceeds its functional purpose and becomes a personal object (e.g., the robot is part of the social dynamics of the workspace or its use is linked to the employee's self-identity).

Our multiple consecutive studies exploring people's acceptance of socially interactive robots revealed several specific factors that may facilitate the introduction of robots into human-shared spaces. People with no or limited previous experiences with robots seem reluctant or even anxious to (socially) interact with such machines. They seem concerned about their privacy (e.g., who will have access to all the personal data the robot stores on its servers), regard interacting with robots as unsafe (e.g., how can someone be sure that a robot will not run them over?), and believe they are unable to work with robots (i.e., people often perceive robots as complex machines for which specific training is needed). With the increasing complexity of robots' inner workings, a lack of digital skills may prevent certain groups of people to make optimal use of these machines. Research on the digital divide shows that those people are falling into existing and deep-rooted patterns of social and economic inequalities (Van Dijk, 2006). The consequences of the rise of robots in organizations may heavily depend on who will (mostly) benefit, which marks the necessity to keep track of people's digital skills related to optimal robot use.

Due to our limited exposure in the real world, robots often face the unrealistic challenge to meet people's images of robots as portrayed in popular media. People hold overly high expectations about the capabilities of robots. People often think current robots are already capable of fluent conversations on any topic, whereas every line of speech (both its understanding and generation) needs to be pre-programmed into the robots system. When robot cannot meet people's expectations, people tend to abandon the robot's use in the longer-term (De Graaf, Ben Allouch & Van Dijk, 2016). Our expectations of robots are strongly linked to their appearance and shaped by the context in which the robot is placed (Philips et al., 2017). Given the strong role of people's expectations, designers should guide those expectations by matching a robot's appearance with its functionality and role in a given context. For organizations starting to work with robots, timely and clear communication and training about the features of the robot can also help in managing such expectations.

A worthwhile and social presence

People's perceptions of the robot and its abilities become even more important once people have been using a robot for a while (De Graaf, Ben Allouch & van Dijk, 2017, 2019). When people still experience some novelty effects, they expect their interactions with the robot to be enjoyable. However, when early adopters feel overwhelmed by the robot's intelligence, they are more likely to reject it. This might be a result of people's inexperience with fully-autonomous machines. In that case, this issue may vanish once people get more familiar with working with robots. This, in turn, may automatically decrease people's current aversion towards artificial intelligence. For employees, it might be important to

familiarize themselves with the robot in a safe context, where they can experiment with it. Also, as employees' basic need for autonomy strongly correlates with their work motivation and psychological well-being (Janssen, Van Vuuren & De Jong, 2013), it might be important for them to still have a feeling of ownership over the task they perform together with the robot. Designing the robot in such a way that its users have options to configure the robot themselves, might be one way to support such feelings of ownership.

After people have familiarized themselves with the robot, people decide to continue the robot's use based on their perception of the robot's sociability and their ability to meaningfully integrate its use into their daily practices (De Graaf, Ben Allouch & Van Dijk, 2016, 2017). Although robot technology is rapidly enhancing, the added value of most robots often remains inferior compared to other technologies or practices currently in place. Yet, our studies show that the perceived usefulness of the technology's application is part of a person's decision to accept a robot in their daily practices (De Graaf et al., 2019). For employees, the need to feel competent in their work is another basic need to fulfill for intrinsic motivation (Janssen, Van Vuuren & De Jong, 2013). Thus, working with the robot should optimally be competence-supportive. This means that organizations should carefully review the advantage of integrating a robot into the daily practices of their employees, and critically consider what specific tasks or roles those machines should commence. The purpose of the robot or its relative advantage over other technologies or practices must be prevalent for successful integration into the workplace.

Despite their initial skepticism of robots as social agents that provide companionship, people behaved socially towards robots in the long run (De Graaf, Ben Allouch, & Van Dijk, 2016). They talked to the robot, gave it a name, and inferred intentionality and agency from its behaviors. Yet, there seem to be two types of people regarding the sociability of robots. On the one hand, some people indicated an aspiration for more sophisticated social capacities in those machines. In our long-term study, these people would attempt to increase the social interactions of the robot by adjusting its settings. On the other hand, some people could not appreciate the robot's social behavior at all. Those people seem to regard robots as functional tools that should only perform actions when human users initiate the interaction. In our study, these participants experienced feelings of unease when the robot initiated unsolicited conversations and would reduce the social features of the robot to a minimum. Nevertheless, a lack of perceived sociability in the robot was one of the main reasons for participants to discontinue its use after initial adoption. Those participants indicated that they might have used the robot for longer if it were more responsive, would initiate to converse in small talk, or had a wider range of conversational topics. Increasing the sociability of robots may eliminate the uncomfortable and distressing feelings people currently anticipate when interacting with these machines as they still lack fundamental social capacities (i.e., knowing when to speak and how to respond appropriately during social interactions).

The influence of social structures in organizations

While the factors above mainly concern individual aspects of adoption and use, another pressing aspect for successful integration of robots in organizations revolves around the effects of robot use on the social structure within organizations. However, current empirical research mostly focuses on the specific features of robots that may ease isolated human-robot interactions, while studies on the actual use in organizational contexts are still limited. As our current research into employee-robot collaboration is ongoing, we present some findings of older but still relevant work of Siino and Hinds (2005).

The employees in this study were introduced to a mobile autonomous robot, designed for use as a courier in hospitals and research laboratories. It delivered medications, documents, and other materials between specified locations within a building. Drawing on an ethnographic study of the implementation of the robot, the authors show how the structural positions of different groups of employees in a community hospital lead employees to make sense of the introduction of this robot in distinct ways. Three different groups of employees held three different expectations of the robot's abilities, dependent on their particular structural position within the hospital's hierarchy. In turn, these expectations influenced their evaluation and use of the robot.

First, male engineers and high-level hospital administrators generally perceived the robot as 'a machine'. These employees saw the robot as a machine they could control. In fact, they did have great control over how the robot was programmed, and thus, used. Second, female directors of departments, female food-service workers, and female pharmacy technicians perceived the robot as 'human male'. They anthropomorphized the robot as a human, a process that often occurs when people interact with robots. All women who anthropomorphized the robot as a male – even before they saw the robot for the first time – were in charge of low-status departments as compared to the male employees who perceived the robot as a machine. The female workers viewed the robot as out of their control, having no influence on how it was being used, and the robot as a man symbolized their relative lack of power and control in the organization. Last, the nursing staff generally referred to the robot as 'a novelty.' They perceived the robot as something with no work utility and they did not believe that the robot would ease their workloads. Rather, they perceived the robot as further

evidence that the desires of those in higher-status jobs were prioritized over their desires and needs. For them, the legitimacy of this technological innovation was low. This study shows, as with any other technology, that the implementation of a robot in an organization might have political consequences, giving certain employees higher status, power, or importance than others. To increase the adoption and use of robots in organizations, we need to take into account such consequences that might affect how employees perceive and understand robots.

Conclusion

For successful integration of robots into the workplace, a major challenge lies with both the developers of these machines and the managers responsible for their implementation. Reviewing our collective studies on robot acceptance, robots should be easy to use and correspond to people's expectations to capture users in the short term and functionally relevant and socially competent to keep those users in the longer term (De Graaf et al., 2017). Based on our research on how organizational contexts may support employee motivation, organizations should facilitate the integration of robots by addressing employees' basic needs for autonomy and competence. When implementing robots, organizations need to take employees' fears about job loss and robots controlling the nature of work into account. Moreover, as some employees may lack the digital skills necessary to work with the robot, it is important to keep track of employees' digital skills and train them when necessary. Notwithstanding that the functional impact of robots in organizations may sometimes still be limited, their social impact already seems to be profound. For successful deployment of robots working alongside or even together with humans, we need to anticipate and address employees' differences in perception. Gaining legitimacy for the introduction of a robot should be a basic prerequisite. Paying attention to the various groups, their structural positions, working conditions, and fulfillment of their needs, seems to be key here. Lastly, evaluating people's perceptions and behaviors during long-term use in real-world contexts is necessary for assessing and intertwining the various social, scientific, and technological concerns that are relevant for designing robots for the workspace. Involving future users at the early stages of design is important for developing socially robust rather than merely acceptable robotic machines.

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