Toward a New Service Reality: Human–Robot Collaboration at the Service Frontline

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1 Introduction

Since their inception, robots have inspired authors, directors, and thinkers worldwide. But only recently, we see robots moving into people's everyday lives in the wake of rapidly developing computer technologies and robots.

Note: This chapter draws on the following publications: Jochen Wirtz, Paul Patterson, Werner Kunz, Thorsten Gruber, Vinh Nhat Lu, Stefanie Paluch, and Antje Martins (2018), "Brave New World: Service Robots in the Frontline," *Journal of Service Management*, Vol. 29, No. 5, pp. 907–931, https://doi.org/10.1108/JOSM-04-2018-0119; Jochen Wirtz (2020), "Organizational Ambidexterity: Cost-Effective Service Excellence, Service Robots, and Artificial Intelligence," *Organizational Dynamics*, Vol. 49, No. 3, pp. 1–9, https://doi.org/10.1016/j.orgdyn.2019.04.005; Jochen Wirtz, Werner Kunz and Stefanie Paluch (2022), "The Service Revolution, Intelligent Automat and Service Robots," The European Business Review, January-February, pp. 38–44., and Lu, Vinh Nhat, Jochen Wirtz, Werner Kunz, Stefanie Paluch, Thorsten Gruber, Antje Martins, and Paul Patterson (2020), "Service Robots, Customers, and Service Employees: What Can We Learn from the Academic Literature and Where are the Gaps?" *Journal of Service Theory and Practice,* Vol. 30 No. 3, pp. 361–391

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One of the first business fields is services industries (e.g., hotels, restaurants, retail). Technologies rapidly become smarter and more powerful, while at the same time they get smaller, lighter, and cheaper. These technologies include hardware such as that related to physical robots, drones, and autonomous vehicles and their components (e.g., processors, sensors, cameras, chips), wearable technologies, and code or software such as analytics, speech processing, image processing, biometrics, virtual reality, augmented reality, cloud technologies, mobile technologies, geo-tagging, low-code platforms, robotic process automation (RPA), and machine learning (Bornet et al., 2021; Wirtz et al., 2018, 2022; Wirtz, 2020). Together, these technologies will transform virtually all service sectors (Kunz et al., 2019). Service robots and artificial intelligence (AI), combined with these technologies, will lead to rapid innovation that can dramatically improve the customer experience, service quality, and productivity all at the same time (Wirtz & Zeithaml, 2018).

We are now at a turning point, where humanoid robots (e.g., Pepper and Nao) and voice-based virtual assistants (e.g., Siri and Alexa) enter our daily lives. Due to the rapid advancements of robot technologies combined with artificial intelligence (AI), Big Data analytics, cameras, sensor, and speech recognition, so-called service robots are on the rise (Wirtz et al., 2018). They are capable of performing tasks autonomously without any human involvement (Joerling et al., 2019), bringing warmth and competence to the service delivery (Yoganathan et al., 2021), executing tasks by following their service-script and with prior knowledge (Huang & Rust, 2018), and are said to be an important source of innovation (Rust & Huang, 2014). In this chapter, we mainly focus on the organizational frontline, the point where the service is delivered to the customer, using the following definition: "Service robots are system-based autonomous and adaptable interfaces that interact, communicate and provide service to an organization's customers" (Wirtz et al., 2018, p. 909). Service robots are typically embedded in larger (virtual) networks that provide access to internal and external data. Autonomous robots can recognize and learn from their environments and make their own decisions without human intervention. With the help of cameras and sensors, robots can identify customers through facial or voice recognition and provide services according to the customer's profile, which they can access through the interconnectedness of the systems.

Robot- and AI-delivered service offers unprecedented economies of scale and scope as the bulk of the costs are incurred in their development. Physical robots cost a fraction of adding headcount, and virtual robots can be deployed at negligible incremental costs. Likewise, virtual service robots (e.g., chatbots and virtual agents) can be scaled at close to zero incremental costs. Such

dramatic salability does not only apply to virtual service robots such as chatbots but also to 'visible' ones such as holograms. For example, an airport could install a hologram-based humanoid service robot every 50 meters to assist passengers and deal with common questions (e.g., provide arrival and departure information, directions to check-in counters for a particular airline, airport hotel) in all common languages. These holograms only require low-cost hardware (i.e., a camera, microphone, speaker, and projector) and do not need to take up floor space (travelers could push their baggage carts through a hologram when it gets crowded) (Wirtz et al., 2021a).

Already, many firms show eager interest in experimenting with service robots. For example, hotels are introducing humanoid robots in their lobbies to welcome guests, provide information, and entertain guests. The Mandarin Oriental Hotel in Las Vegas has introduced Pepper as their newest humanoid staff member. Pepper resides in the lobby, where she welcomes guests and helps them with directions. Her job is to provide information to hotel guests entertainingly and innovatively (Walsh, 2018). In Japan, the Henna Hotel is the first robot-staffed hotel, where guests can check in with an android woman, a robot, or a dinosaur robot. Luggage is delivered to the room by a porter robot, and the concierge robot Tully switches the light on and off for the guest (Kikuchi, 2018).

At airports, robots scan boarding passes and help passengers to find the right departure gate. Self-moving check-in kiosk robots detect busy areas and autonomously help passengers reduce waiting times (Paluch et al., 2020). At the airport, robots are used in the form of passenger guidance, maintenance, or security. At Amsterdam Airport Schiphol, the robot Spencer scans KLM passengers' boarding passes and helps them find the right departure gate. Kate, a self-moving check-in kiosk robot, works at Kansai Airport in Japan and detects busy areas, autonomously going there and helping passengers reduce waiting times. At Incheon Airport in South Korea, cleaning robots vacuum the airport and in Shenzhen's Bao'an International Airport, Anbot, a security robot, patrols the departure hall for suspicious behavior (Read, 2017).

The outbreak of COVID-19 has increased the demand for medical service robots that take over the medical care of contagious patients. For example, the social robot Ari interacts with COVID-19 patients to help them overcome their isolation. Other robots make sure that patients get their medicine, and they can monitor vital signs remotely. Additionally, autonomous robots disinfect hospitals and make sure patients and visitors follow the regulations and maintain social distancing (Schoepfer & Etemad-Sajadi, 2020).

Further, societal changes such as an increasing elderly population and declining workforce infuse robots in somewhat unexpected contexts, such as

nursing care, which typically requires a more personal touch and individual attention. In Tokyo's Shin-tomi nursing home, robots help caretakers lift people and perform exercises with groups of elderly residents and initiate engaging conversations (Foster, 2018).

The above examples demonstrate that service industries are changing, and more businesses are considering reorganizing their organizational frontline service (Kunz & Walsh, 2020). Studies suggest that by 2025, 85% of customer interactions will occur without a human agent (Schneider, 2017). The market size for service robots is projected to reach USD 41.5 billion by 2027 (Fortune Business Insights, 2020).

Such robots in hotels, airports, and restaurants, as well as chatbots and delivery bots, are only the beginning of the service revolution. This means that similar to the shift that started during the Industrial Revolution from craftsmen to mass production, an accelerated shift in the service sector toward robot- and AI-delivered services can be expected. The exciting prospect is that many services, including healthcare and education, are likely to become available at much lower prices and better quality, leading to a dramatic increase in our standard of living.

In this chapter we want to illustrate the new service reality induced by innovative technology. We highlight the difference between older automated self-service technologies and service robots. Further, we analyze the difference between human service employees and service robots and show avenues for collaboration and specialization in the Service Robot Deployment Model. Finally, we close with managerial implications for the service frontline in the new service reality with robots.

2 Self-Service Technologies Versus Service Robots

Service robots have been defined as "system-based autonomous and adaptable interfaces that interact, communicate and deliver service to an organization's customers." (Wirtz et al., 2018). These abilities differentiate service robots from traditional self-service technologies (SSTs). We are familiar with the context of ticketing machines, websites, and apps (Yoganathan et al., 2021). As shown in Exhibit 1, service robots can deal with unstructured interactions and guide customers through their service journey. For example, a ticketing robot will not let customers get stuck as it can ask clarifying questions (e.g., "Is your return trip today?" "Can you travel off-peak?") and can even recover

Exhibit 1 Contrasting service robots with traditional self-service technologies

Service aspect	Self-service technologies (SSTs)	Service robots
Customer service scripts and roles	• Customers have to learn the service script and role and follow them closely	• Customers do not need to learn a particular role and script beyond what they would do when interacting with a frontline employee
	• Deviations from the script tend to lead to service failure and termination of the unsuccessful transactions	• Flexible customer journeys, interaction, and scripts are supported
	• Need to be self-explanatory and intuitive as customers have to control and navigate the interaction	• Can guide the customer through the service process very much like a service employee would
Customer error tolerance	• Generally, do not function when customers make errors or use the SST incorrectly	• Are customer error-tolerant
	• Are generally not effective in recovering customer errors; customers typically have to start the transaction again, or a service employee needs to take over	• Can recover customer errors and guide the customer to conclude a successful service transaction
Service recovery capability	• The service process tends to break down when there is a service failure; recovery is unlikely within the technology	• Are 'trained' to recover common service failures • Can recover the service by offering alternative solutions very much like a service employee would

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customer errors (e.g., a wrong button pressed, incorrect information entered, or a rejected credit card). For most standard services, customers will interact with service robots much like service employees do (e.g., "I need a same-day return ticket and can I use Apple Pay?").

3 Human Service Employees Versus Service Robots

A key element of every service company is the employees that deliver the service to the customer. Thus, a comparison between technology is worthwhile, but a deeper understanding of the strengths and weaknesses of human service employees compared to robots is critical.

Emotional Touch vs. Customized Tech

It is common in service industries to say the frontline employee is the face of the company. The service is determined by the frontline personnel's skills, training, emotions, personality, and attitude. Depending on the company strategy, the human touch can be the key differentiating factor for service excellence. Personal service entails genuine emotions from one human being to another. In contrast, robots are not able to feel and express real emotions. This is important as the service management literature distinguishes between deep acting (employee displays true emotions) and surface acting (employee displays superficial, fake emotional response) (e.g., Wirtz & Jerger, 2017). A robot's emotional display is likely to be "fake" and displayed, and not authentic and truly felt. Consumers are likely to know this, perceive it, and respond accordingly. Thus, customers are unlikely to respond to robot-displayed emotions as they would to "heart-felt" and authentic emotions from human frontline employees (Wirtz et al., 2018).

Individual Person vs. System-Based Approach

Another distinction is that human employees are individuals with their personalities, skills, perceptions, biases, and services, showing heterogeneity over time and across individual employees. Education of the frontline personnel is needed, and employees need to know the processes to do a good job. People need to learn the routines, memorize all relevant information, and get used to the computer assistant system to access more information. This process takes time and is not seamless. Robots, on the other hand, are system-based approaches. They can be connected to a knowledge database and use all available information from customer relationship management (CRM) systems and the Internet to provide their service.

High Incremental Cost vs. Low Incremental Cost

Finally, human employees are not scalable. Every person adds significant costs to the company. In contrast, robots entail enormous economies of scale. Thus, much of the costs build up during the research and development. Physical robots have incremental costs, even though they are at a fraction of adding headcount. In comparison, virtual robots are likely to be deployed at negligible incremental costs (Wirtz et al., 2018). Other significant differences are summarized in Exhibit 2.

Exhibit 2 Contrasting frontline employees with service robots

Dimension	Service employees	Service robots
Employee/ robot training and learning	• Act as individuals, individual learning • Need training • Limited memory and access	• Act as part of systems, are connected, system learning • Upgradable, system-wide • Virtually endless memory and access
Customer experience	• Heterogeneous output • Customization and personalization depend on employee skill and effort • Unintended biases • Have genuine emotions • Can engage in deep acting • Can engage in out-of-box thinking and creative problem solving	• Homogenous output • Customization and personalization can be delivered to scale with consistent quality and performance • Potentially no biases • Can mimic emotions • Can engage in surface acting • Limited out-of-box thinking, have rule-bound limits
Firm strategy	• Service employees can be a source of competitive advantage • High incremental cost • Low economies of scale and scope • Differentiation on service can be based on better hiring, selection, training, motivation, and organization of service employees	• Just the deployment of service robots is unlikely to be a source of competitive advantage in the eye of the customer (very much like ATMs are sold to banks) • Low incremental cost • High economies of scale and scope • Economies of scale and scope and related network and service platform effects will become important sources of competitive advantage

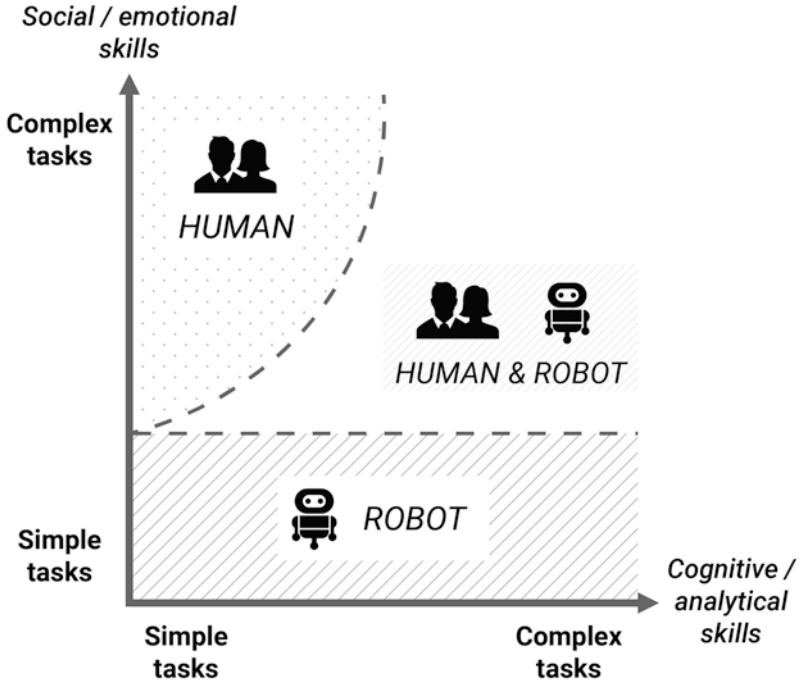
Adapted from Jochen Wirtz, Paul Patterson, Werner Kunz, Thorsten Gruber, Vinh Nhat Lu, Stefanie Paluch, and Antje Martins (2018), "Brave New World: Service Robots in the Frontline," Journal of Service Management, Vol. 29, No. 5, p. 909, https://doi.org/10.1108/JOSM-04-2018-0119

4 The Service Robot Deployment Model

Given these distinctive aspects of human employees and service robots, companies need to decide which tasks human employees will take care of and which are handled by robots in the future.

Tasks can be organized based on their need in doing cognitive and analytical work or emotional or social work. Depending on the combination of these two dimensions, Wirtz et al. (2018) proposed the Service Robot Deployment Model, where they predict which tasks will be done by humans, by robots, or in human–robot collaboration in the future (see Exhibit 3).

Exhibit 3 The Service Robot Deployment Model. (Adapted from Jochen Wirtz, Paul Patterson, Werner Kunz, Thorsten Gruber, Vinh Nhat Lu, Stefanie Paluch, and Antje Martins (2018), "Brave New World: Service Robots in the Frontline," Journal of Service Management, Vol. 29, No. 5, pp. 907–931, https://doi.org/10.1108/JOSM-04-2018-0119)



Given the system-based approach and the decreasing costs of computer calculations (i.e., Moore's law), robots have a clear advantage against human employees regarding cognitive and analytical work. On the other hand, human employees can provide the emotional touch of a service that is hard for robots to simulate. Therefore, when it comes to jobs with high cognitive/analytical tasks and low emotional/social work, robots will mainly provide these services, while when it comes to jobs with low cognitive/analytical tasks and high emotional/social work human employees are essential.

Some jobs in services might only need low cognitive/analytical work and little emotional/social work. Wirtz et al. (2018) assume that robots will be able to mimic simple emotional/social tasks in the future. Hence, they are a more cost-efficient solution than human employees. On the other hand, jobs that require high cognitive/analytical work and emotional/social work are likely to be delivered by humans supported by robots—robots will outperform humans on cognitive tasks, while humans will provide the emotional tasks of the job (Larivière et al., 2017).

Service Robot Infusion for Different Service Tasks

The persistent problem is that customers perceive service robots to have less competence than human service employees (Paluch et al., 2020). If companies are now considering the increased use of service robots, they must also make sure that service quality does not suffer. Customers may misunderstand the step and see it as a cost-saving measure, not interacting with the provider in different ways. We are currently still in the phase in which robots must prove themselves from the customer's perspective. In this phase, companies and managers can do a lot right and a lot wrong.

First, we need to understand the different service types. Therefore, we build on the matrix from Wirtz et al. (2018) and Paluch et al. (2020), in which service tasks are classified based on the level of cognitive/analytical skills and social/emotional skills. The underlying assumption is that robots benefit from artificial intelligence and can therefore better handle complex decision-making situations in which cognitive/analytical skills are highly demanded. Humans, however, can show real emotions since they can intuitively react to certain situations and are therefore better at displaying social/emotional skills.

Service Robots Take Over Routine and Repetitive Tasks

Initial deployments of service robots focused on simple and repetitive tasks that tended to be low in cognitive and emotional complexity. For example, physical robots in hotels deliver room service and bring baggage to guest rooms. However, text- and voice-based conversational agents increasingly handle routine customer interactions. Even when interacting with a human service employee, that employee may well be supported by AI, and calls are prescreened, preprocessed, and then escalated to the human agent because of their complexity. The outcome is that customer contact staff do not have to deal with high volumes of trivial customer requests but instead can spend their time on higher-value and higher-level tasks. For example, a chatbot for the NUS MBA Program handled 20,000 unique conversations per month right after launch and answered all the routine questions the admission team had to deal with previously (e.g., Do I need a GMAT? When are the fees payable? When is the application deadline?). As a result, the admission team can now focus on top-quality candidates and the more tricky and complex discussions.

In the *first scenario*, where cognitive-analytical skills and social/emotional skills are low, service robots can perfectly take over tasks, such as vacuuming the floor, mowing the lawn, patrolling airports, or delivering luggage to guest rooms to customers. In these service contexts, customers' expectations regarding emotions or any form of active, reciprocal interaction are low. The most important thing is that the job is done efficiently and effectively, so the robot's advantages outweigh human benefits, especially in terms of availability and delivering continuous service quality. This category of service jobs might not be among the most popular, and in times of labor shortages, we recommend these tasks be assigned to robots first. In some instances, it might be helpful to have human supervisors who can support service robots to ensure the reliability of the service.

Service Robots Outperform Humans with High Cognitive Skills

In addition to routine tasks, services that require high cognitive and analytical skills will be delivered effectively by service robots (e.g., financial services). For example, service robots can analyze large volumes of data, integrate internal and external information, recognize patterns, and relate these to customer profiles (Kunz et al., 2017). Then, within minutes, these robots can propose best-fitting solutions and make recommendations.

In the *second scenario*, where cognitive/analytical skills are high and social/emotional skills remain low, we expect the demand for service robots to increase. In professional service industries, such as insurance and accounting, or in legal contexts, significant amounts of information need to be analyzed quickly, and customers require reliable results and objective recommendations without much sentimentality. These analytical jobs can be better done by robots. A great advantage from the customer's perspective is the equal treatment by robots because robots' decision-making is solely based on available information, so customer discrimination is almost impossible. Companies should prioritize security and privacy concerns and communicate data usage transparency, especially when robots work with sensitive customer information (Wirtz et al., 2021a). It is also recommended to inform customers about changes in the frontline organization or the technology used to deliver the services because a well-informed customer can appreciate changes.

Emotional Skills Are a Human Asset that Is Difficult to Copy

It is difficult for robots to deal with emotions that go beyond a pleasant surface demeanor. Especially complex and emotionally demanding tasks are still better handled by service employees as they can bring genuine emotions such as excitement and joy or empathy and compassion to the service encounter. For example, in complaint and service recovery situations, humans can respond better to the individual context and show understanding.

In the *third scenario*, tasks require high social/emotional skills and less cognitive/analytical expertise. Human service employees have superior skills to perform tasks in hotels, restaurants, airlines, retail, or entertainment industries in which the personal experience is central for customers. These services are characterized by high interaction between the service employee and customer, and service quality is often measured based on the service counterpart's behavior. Considering our examples at the beginning of the chapter, hotels, restaurants, and airports are areas where service robots are preferably used, even though human service employees have better skills to deliver these services. Companies that have introduced service robots to deliver personal services (e.g., hairdressers, yoga teachers, or shopping assistants) should respect customers' different interaction preferences. Based on our analysis, we found two types of customers. Type 1 customers belong to the group that prefers human interaction and is reluctant to interact with service robots. Type 2 customers like the idea of avoiding personal interactions in service settings and are happy to give orders or push a touchscreen to receive their service. To maintain strong/good/positive service quality perceptions, managers should try to satisfy both customer segments by offering human and artificial alternatives and choosing according to their preferences.

Interestingly, service robots are already able to create a social presence with customers, so the customer has the feeling that somebody is taking care of them, even it is a robot (van Doorn et al., 2017). Companies can also offer their services as a two-tier model. Service robots will take over the initial contact, and for issues that require greater communication skills or psychological comfort, the service employee can take care of the situation. This approach seems suitable for complaint handling or service recovery situations that require experiential and contextual interactions and individualized treatment. In general, it is advisable not to leave the customer entirely alone with robots and to keep people available as a backup for troubleshooting or intervention in emergencies.

Service Robot and Human Employees Form Hybrid Teams in the Future

Human–robot teams will increasingly deliver tasks that require high cognitive and high emotional skills. For example, in a healthcare context, service robots will do the analytical work (e.g., analyze symptoms and compare them with databases to identify possible diagnoses), and humans will make the final recommendations and decisions and take over the social and emotional tasks (e.g., advising and persuading patients). For example, a traveler returns from Singapore to Munich with dengue fever; the symptoms only show up a week after returning. General practitioners in Germany may never see a dengue fever patient in their professional life and may not be effective in diagnosing it. On the other hand, a service robot compares patient data and symptoms and provides a 'hit list' of possible diseases with a fit index. The general practitioner can then work down the list and discuss with the patient (e.g., "Have you been in the tropics in the last two weeks?") and then identify the most likely diagnosis and test for it.

In the *fourth scenario*, cognitive/analytical skills and social/emotional skills are high, such as counseling, nursing, education, or medical services. In the future, these services can be delivered by hybrid teams (human service employees and service robots) to increase the outcome quality and, in general, to provide more accurate services. The newly formed teams provide innovative (business) opportunities and are proof that service robots are not only designed to replace or substitute human employees but to support joint decision-making (Jarrahi, 2018). In these hybrid teams, task responsibilities are distributed between service robots that process information and the service employee, who enriches the interaction with the customer with social and emotional competencies. There are already some examples of how hybrid human–robot teams work together at the frontline of services. For example, in the medical context, machines can carry out tasks that were previously performed by employees (skin cancer detection (Esteva et al., 2017), and human doctors can take care of the patient and discuss treatment options. As this example shows, robots do not necessarily replace human resources. Still, tasks and responsibilities are redefined and reassigned within the organization, so it is a matter of redistribution rather than substitution.

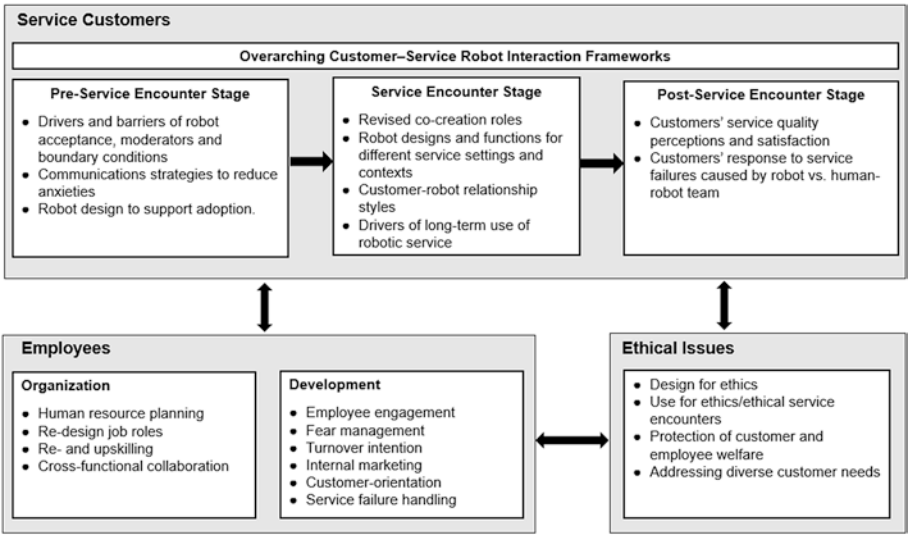
5 Implications for Managing Service in the Frontline

The digital revolution of the service sector will have enormous implications for business. The new capabilities induced by AI, intelligent automation, speech and image processing, biometrics, virtual and augmented reality, mobile technologies, robotic process automation (RPA), and machine learning are limitless. This new service reality brings up new pressing issues for service organizations to tackle. Some of these issues are described in the following sections (Exhibit 4).

The Service Industry Is at an Inflection Point

The service sector is at an inflection point concerning productivity gains and service industrialization, similar to the Industrial Revolution in manufacturing that started in the eighteenth century. For companies, this disruption and the continually evolving technology creates a growth opportunity in which new service offerings can be introduced or adapted, and business

Exhibit 4 Future research directions in robotic service encounters. (Note: Adapted from Lu, Vinh Nhat, Jochen Wirtz, Werner Kunz, Stefanie Paluch, Thorsten Gruber, Antje Martins, and Paul Patterson (2020), "Service Robots, Customers, and Service Employees: What Can We Learn from the Academic Literature and Where are the Gaps?" Journal of Service Theory and Practice, Vol. 30 No. 3, pp. 361–391)



models can be reconsidered (Rust & Huang, 2014). Traditional service companies should use this artificial intelligence infusion to revive their image, brand, marketing, and positioning, to stay competitive in the long term (Huang & Rust, 2018).

Reconstruction of the Organizational Frontline

With service robots' implementation, organizations will inevitably be transformed and dramatically reorganized. This requires strong leadership and support, employee willingness, and ability to change. Employees will be assigned to new tasks and responsibilities and will need to develop the necessary skills (including RPA, programming, and technology troubleshooting). This means that the skills and competencies of human service representatives might change in the future, and the job market requirements can be affected by this shift. Thus, employees will focus in the future more on tasks that are still handled better by humans. This includes especially socio-emotional tasks (e.g., building rapport, creating a welcoming atmosphere), but might also include high-level cognitive analytical tasks despite the advantage of robots in this area. An example of this might be a cancer diagnosis. If a service task consists of a lot of responsibility, the customer might prefer a human being instead of a robot to make a last judgment call (Wirtz et al., 2018). The company itself must be ready for change, so the AI spirit can be experienced at all levels of the service company and not only at the customer frontline.

More Human–Robot Collaboration in the Future

We do not think that robots will completely substitute human service employees now or in the future. In fact, we strongly disapprove of this assumption for the service industry. As stated above, humans might be substituted by robots for some standardized tasks (e.g., routine tasks), but we do not want to generalize that to all kinds of service contexts. Instead, we predict that hybrid human–robot teams and collaboration will be the preferred service delivery model for the future (Wirtz et al., 2018). These hybrid teams will realize productivity and service quality gains for the company by combining the advantages of AI and human service representatives.

AI as Opportunity for Cost-Effective Service Excellence

We predict that hybrid human–robot teams and collaboration will be the future service model for many more complex service contexts. These hybrid teams will realize productivity and service quality gains for the company by combining the advantages of AI and human employees. Robots' enormous knowledge and data are an undeniable advantage for creating customized services (Bornet et al., 2021). Therefore, organizations should focus on implementing, managing, and fine-tuning the deployment of robot-employee-customer co-creation teams to deliver an unprecedented quality of interaction for their customers.

Service robots are not the answer to everything but might be an excellent way to increase customer service quality. The unlimited knowledge and immediate access to customer profiles are undeniable advantages that customize service offerings even further. Customers receive individual service or product recommendations based on their past purchase behavior and could save valuable time interacting with service robots. Another beneficial aspect is reduced waiting time for customers since they can immediately approach a service robot. When issues get more complex or require individual attention or recovery, employees can join the encounter and support the problem-solving process with emotional or social skills. These new ways of interacting could contribute to a better overall service experience.

Mitigate Potential Risks of Robot Deployment

Finally, organizations also need to mitigate potential misconceptions, prejudice, and anxieties related to customer-facing service robots, such as algorithm aversion, perceived loss of the human touch, and consumer privacy. This requires organizations to embrace corporate digital responsibility and develop a set of shared values, norms, and actionable guidelines on the responsible use of technology along the full cycle (Wirtz et al., 2021). For example, related to data, this includes their capturing (e.g., using biometrics or social media accounts), their use (e.g., to build variables such as a healthiness index or financial score), decision-making (e.g., approve loans and set interest rates), and their retirement (e.g., when is information on a bounced payment deleted from the firm's database).

We still believe that human service employees are primarily responsible for building trusting relationships with customers. Their empathic and benevolent behavior as well as genuine emotions are underlying foundations for trust and cannot be copied by robots at the moment. Again, service robots can assist employees with information and customized recommendations based

on the customer profiles they access during the interaction. We expect that in the near future, it will be normal for service robots to be connected with CRM databases and use the information during customer interaction. As soon as service robots recognize customers through their sensors and cameras, they can retrieve customer profiles, address them by name, and help them with their requests.

In summary, service robots and AI will transform our service sector and bring unprecedented improvements to the customer experience, service quality, and productivity, all at the same time. That is, the service revolution has the potential to dramatically increase our standard of living as much as the Industrial Revolution did for manufactured goods. Only this time, services such as financial, logistics, healthcare, and education are being industrialized.

More research is needed to better understand how to implement service robots, the effect on the customer, and the employee who works side by side with the robot. Lu et al. (2020) gave a good overview of the service robot literature and worked out various areas where we need more research. We look forward to going on this academic journey together with our research field.

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