Meaningful Futures with Robots—Designing a New Coexistence

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Chapter 3

How to Design Robots with Superpowers

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Meet accomplicebot. It supports nurses in getting to know new patients. Both the nurse and the robot approach the patient together with the robot usually taking the first step and initiating the conversation. In contrast to a human being, a robot has no inhibitions and is free of prejudice, having no concept of age, body size, race, or the sex of a patient. It therefore approaches a new patient without hesitation or shyness and takes the usual steps of getting to know a new patient—knowing what to ask for and how. Based on the conversation, it deducts all necessary medical information and saves it to a file. Naturally, it cannot carry out all of the communication by itself. For more human matters, the nurse jumps in and makes the conversation more personal by showing empathy and using calming words with the patient. These are things that accomplicebot is not so good at, which is why they work as a team. Here, it fades into the background and just listens. Sometimes, however, conversations can become difficult for the nurse, in which case the robot serves as a shield: it can absorb some of the patient's anger or clarify misunderstandings. Together, the nurse and accomplicebot develop a shared method of getting to know patients, based on the particular skills of each.

We jointly developed the concept of the accomplicebot with a practicing nurse in training. All of the information about the difficulty with overcoming shyness when first approaching patients, and particularly having someone or *something* for support when dealing with unpleasant situations, came directly from the nurse's everyday working experiences. Starting a conversation with new patients is not always easy, especially for introverted nurses. Different patients respond differently, with some being easy to talk to and others not

as much. Patients tend to be anxious and afraid and sometimes unleash these feelings on the staff. Even in this professional setting, and with the relationship between a nurse and new patient, finding the courage to talk to a stranger can be difficult. The nurse could use an accomplice, which is quite a social role for a robot, but one that it could nevertheless take on.

This chapter is about creating concepts for *unusual*, yet relevant, robots. Nowadays when we think of robots, we still mostly think of them as replacing humans. In the context of care, for example, a robot's primary purpose and *work* is to increase efficiency by taking over human tasks. However, this does not necessarily need to be the case, as the example shows. The nurse had a clear idea of an everyday work-related situation that she would love to share with a robot. Working together is simply less lonely, especially when it comes to emotionally challenging situations.

In this chapter, we present a method to design application concepts for robots, which are not meant to replace humans, but complement them, with their own unique technological strengths. Using a co-design process, we developed ideas for social robots, together with potential users, by combining valuable subjective insights from their everyday working lives with the notion of "robotic superpowers" (→p. 27, Dörrenbächer et al., 2020; Welge and Hassenzahl, 2016). Robotic superpowers are social strengths, arising from the fact that robots are machines, not humans, such as their endless patience and non-judgmental nature. In the beginning example, the robot's superpower is lacking a fear of rejection. The robot simply has no need to care *emotionally* about the way a human responds; therefore, shyness is not a necessary robotic state. On the contrary, a robot can involve itself almost naïvely in social situations.

We argue that focusing on robotic superpowers, or the ways in which robots may differ from humans in social interaction, can serve as inspiration for designers, guiding them to create new social interactions unique to robots. Instead of focusing on problem solving, designers may look to the new possibilities offered by →possibility-driven design (Desmet and Hassenzahl, 2012). For example, rather than replacing nurses to more efficiently handle the *problem* of care, robots can be used to augment, improve and re-think care. Instead of fixing problems, a possibility-driven approach looks for new positive experiences to aspire to and technological ways to facilitate them. In particular, because the spectrum of social robots in terms of their functions, abilities, and applications is still rather narrow and heavily problem focused (Campa, 2016; Lambert et al., 2020; Pedersen et al., 2018), looking at possible positive future experiences with robots is valuable. In this chapter, we demonstrate how these robotic superpowers can be used to develop concepts and ideas for novel social robots.

Possibility-Driven Design argues that the focus should be shifted from that of using problems as a starting point to designing new technology to possibilities for a future, positive state. The goal becomes designing future technology aimed at happiness and directly improving life (Desmet and Hassenzahl, 2012).

ROBOTIC SUPERPOWERS IN DETAIL

Robots can be used not only to lift heavy things and perform repetitive tasks, but also for their cognitive as well as social strengths. Welge and Hassenzahl (2016, p. 996) identify six psychological superpowers for social interaction with humans: not being competitive, endless patience, unconditional subordination, the ability to always contain oneself, not taking things personally, and assuming responsibility. Note, of course, that this list is not exhaustive. Let's look at these strengths in detail.

Robots have no need to compare themselves to others in social exchanges, or come out on top; thus, they are *not competitive*. Even when there is no obvious competition, humans usually don't like the feeling of being last. Similarly, humans often have difficulty taking a back seat to let others shine, whereas robots do not care. Repetitive interactions often cause humans to become frustrated and impatient, especially in social situations. Robots do not mind repeatedly having the same conversation. Nor do they care about the slowness of a user. They have *endless patience*. If a robot performs a task or supports a user, there is no need to reciprocate. Even in interactions that are essentially social in nature, humans do not have to show gratefulness, or feel burdened, to a robot. Robots have *unconditional subordination*. Robots do not have to have preferences, and they do not like or dislike tasks, things, or human attitudes, and will never complain or judge. They are always able to *contain themselves*. Robots do not take offense or get annoyed. They do not feel rejected and *do not take things personally*. Ultimately, when a robot is assigned a task, it will carry it out with mechanical precision. For clearly defined tasks, robots can *assume responsibility*. Dörrenbächer and colleagues (2020) further expanded the set of robotic superpowers and divided them into three categories. In comparison to humans, robots also have physical superpowers, such as the ability to carry heavy weights or not feel pain. Additionally, robots can have cognitive superpowers, such as being unembarrassed, always focused, or endlessly patient. Lastly, they have communicative superpowers, such as speaking unambiguously, being non-discriminatory, or never getting offended. Both cognitive and communicative powers can serve social purposes.

As a starting point for inspiring ideas for new social robots, we decided to make use of these different categories of superpowers. We further combined all the aforementioned superpowers into one set (→Fig. A for an overview). Naturally, new scenario-specific superpowers can also be added.

THREE STEPS FOR DEVELOPING CONCEPTS WITH REGARD TO ROBOTIC SUPERPOWERS

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Superpowers alone are merely a difference in perspective on how robots can be beneficial in different scenarios, and do not automatically lead to new ideas. What is needed is a process to actually situate superpowers according to the intended scenario. We suggest a preliminary three-step process, based on multiple workshops, in which we explored the value of introducing superpowers into the co-design of new robots in different formats (→Fig. C).

STEP 1—DEFINE AND UNDERSTAND CURRENT PRACTICES

Before thinking about the robot itself, an understanding is necessary of the general application domain and potential specific work →practices the future robot may be introduced to. Here, it is vital to consider current practices and to identify what makes them meaningful and enjoyable as well as any challenges that may be faced. Only after having clarified work practices and their meaning can we start to think about how a specific work practice would and ought to change through the introduction of a robot. It goes without saying that the more complex and removed practices are from the designer's own experience, the more important it is to directly involve practitioners to gather insights about their everyday practices. For example, in one workshop, we set out to create new concepts in domains as diverse as grocery shopping, therapy for autistic children, and patient care. Even though participating designers held brief interviews with stakeholders, it was much easier for designers to find ideas in a domain in which they had personal experience (e.g., grocery shopping) compared to domains in which they had none (e.g., therapy, care). Consequently, we repeated the workshop with direct practitioner involvement. In this iteration, we focused on care and involved a nurse in training. In a relatively short time, we were able to gather typical work practices and gain valuable insights into what makes them positive or negative. Note that we could have also invited patients or family. In fact, each group of stakeholders involved brings its own practices to the table, which broadens the potential for ideas. In the present case, we focused on the nurse's perspective, while being well aware of its limitations. The intended outcome of Step 1 is a broad collection of work practices.

Positive Practices are everyday activities that contribute to our well-being, e.g., phoning a best friend or climbing a mountain. Positive Practices are part of Practice Theory, and they usually need materials (e.g., technology) and skills to be implemented (Lyubomirsky and Layous, 2013).

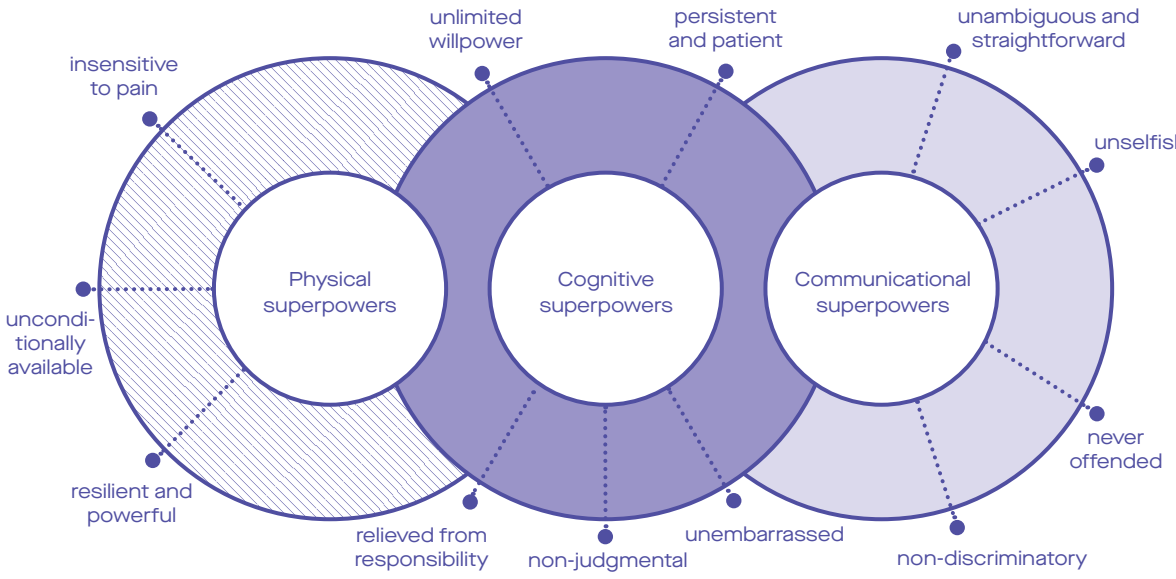

Figure A An overview of the robotic superpowers based on Dörrenbächer and colleagues

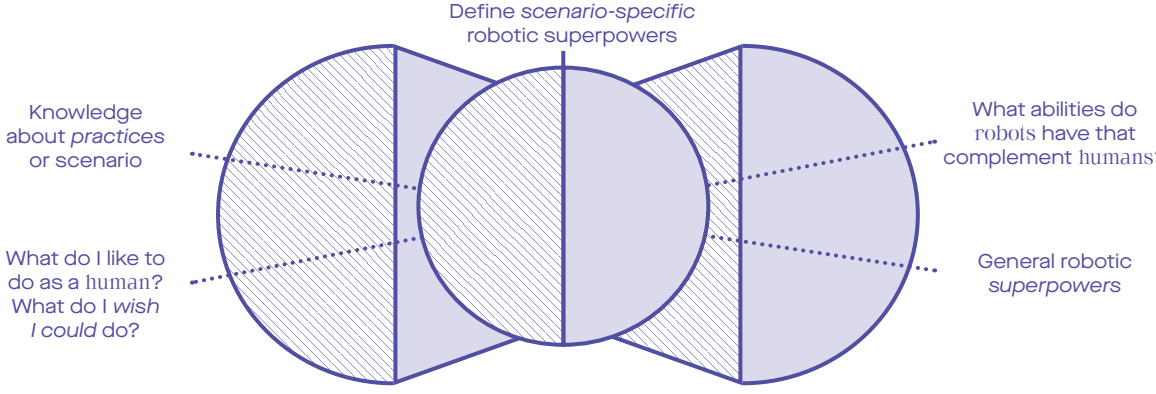

Figure B How to define scenario-specific robotic superpowers

STEP ONE	STEP TWO	STEP THREE
Gain knowledge about the existing *practices* or scenario Involve *stakeholders* for direct insights *Questions:* What are typical tasks? Which skills are needed? What do you like to do? What do you wish for?	Introduce the *robotic superpowers* with brief examples With the insights from step one, *select* which superpowers fit and add new robotic superpowers specific to the scenario Add short descriptions to each superpower	Combine the outcomes from steps one and two to *develop concepts* for future robots *Make decisions:* How is the concept called? What does the robot do? Who interacts with it? How does its superpower play out?
OUTCOME Collection of *practices* with descriptions	**OUTCOME** Scenario-specific subset of *superpowers*	**OUTCOME** *Pool of concepts* for possible future robots

Figure C A step-by-step guide to developing concepts for future robots with the robotic superpowers

STEP 2—SELECT AND ADD SUPERPOWERS

In this step, the set of robotic superpowers (→Fig. A) comes into play, with the general theme being exploration of which existing superpower could be beneficial for selected practices. First, it is helpful to familiarize participants with the overall approach by going through the different categories of superpowers and offering brief examples of what a superpower would mean when applied to a robot (e.g., imagine an endlessly patient robot that could listen to the same story repeatedly). Depending on the practice in question, different powers can be relevant and result in positive and enriching experiences. For example, a robot's potential for patience would be considered a superpower if, and only if, it benefited a practice.

Inspecting the superpowers one by one clearly reveals which of them are helpful to the chosen practice and which are out of place. For example, in our second workshop, involving the nurse in training, the nurse would immediately point out how fitting the robotic superpower was of never being offended when dealing with patients.
As expected, it was also beneficial to brainstorm and try to expand the superpowers at this point. Of the abilities or attributes a robot could possess, which would be desirable in this situation (→Fig. B)? The outcome of this step is the selection of a subset of superpowers with regard to the practices at hand. Short descriptions were useful for keeping track of why and how a superpower was found to be beneficial. In the following step, any immediate ideas for specific robot concepts should be noted for further use.

STEP 3—COMBINE CURRENT PRACTICES WITH SUPERPOWERS TO IDEATE ROBOTS

To ideate new concepts for robots, the insights from Step 1 "current practices" and Step 2 "superpowers" are now combined into a robot. More specifically, imagine a robot with certain superpowers as part of an emerging, transformed work practice. Asking "What if" questions can help to envision and describe a potential future robot and its use (e.g., "What if a robot could have positive social exchanges with patients?"). What does the robot do exactly? Who interacts with the robot? Where and when does it employ its particular superpowers? What would you call it? It is crucial to not restrain oneself with technological feasibility but rather to use these concepts and ideas to formulate aspirations for how robots could positively impact the given domain. Giving each robot a name, writing a brief description, and adding a little sketch helps to more clearly describe ideas and facilitates further discussion. In this third step, the designer's role when working with practitioners is to make suggestions and come up with vague ideas that could be further developed together. What if in a particular situation you had a robot with this specific capability? What should the robot carry out? What would you like to perform?
The outcome of this step is a pool of ideas for possible future robots

based not on technical feasibility but on meaningful future practices. From our perspective, the conceptual design process is foremost examining the possible roles robots can play in different domains and challenging preconceptions of robots and their functions.

FURTHER EXAMPLES OF ROBOTS

Accomplicebot is only one result of enacting this process. Let us share two other concepts to demonstrate the types of concepts the process produces.

THE UNRULY SHOPPING CART BOT

While at first glance it might not seem like it, the supermarket is a place of many decisions. When we go shopping, we choose what we will eat for the next few days, and the consumables we will have available at home, for instance. And each product has a background—how it was produced, which resources were used in its production, the workers who made it available, both for production and transport, and the conditions they worked in. As shoppers, we often set goals for ourselves in which the choices at the supermarket play a vital role. In this particular case, our shopper wants to switch to a healthier diet and buy only goods that are both ecologically and socially sustainable. However, consequently reaching this goal is not always easy. While it is already utterly impossible to have all the information about each product readily at hand while shopping, it is also easily corrupted by conditions in the supermarket, including special offers, sudden cravings, or serious hunger. Enter the unruly shopping cart bot, which is essentially a stubborn robotic shopping cart with a mind of its own. It knows the goals that shoppers have set for themselves and, being a robot, is not so easily corrupted. As the shopper adds items to their cart, the bot rigorously checks the items and rejects anything that does not meet the defined goal and puts it back on the shelf. To make these choices, it always has access to all the information about all the products in the market. As a robot with a clear task, it unwaveringly holds the shopper accountable, and keeps the shopping cart clear of items that don't match the goal, without exception. As a result, new shopping practices develop: Which product is okay, which isn't? Let's substitute with this one. Am I not able to buy milk at all? And, if one really wants something that is technically not okay, it is always possible to cheat and carry the item in one's hands instead of placing it in the shopping cart.

THE FORTHRIGHT SOCIAL SHOPPER

Particularly during the various lockdowns of the Covid-19 pandemic, it became increasingly evident that we not only go to supermarkets to stock up on food and other supplies but also to socialize. You see other people, make small talk at the counter, and run into people from the neighborhood. For people who live alone, it may even be one of the only places where they experience everyday social contact. While it would feel good to chat just a little with someone you often see at the store, it's odd to just start talking to someone you don't know. How do you initiate such a conversation without coming across as weird? Sometimes you feel like your behavior in social situations is odd, especially since you live alone. However, maybe you're just missing an outside perspective to help reflect on what you experienced. Being a robot, the forthright social shopper is totally free of these inhibitions. While sitting at the side of your shopping cart's handlebar, it pretends to keep track of your shopping list, but its real focus is on the other people in the store. It closely observes everyone—how they behave and what they buy—and it never forgets what it sees. In addition, every once in a while, it casually utters an observation. As a woman who lives on the same block passes by, the forthright social shopper audibly says: "If you two combined what you have in your carts, you could bake a fabulous chocolate cake." You apologize for your bot and you and the woman laugh and wish each other a pleasant day. Back home, you ask the forthright social shopper why it started talking in this specific instance. The bot explains that it noticed the woman smiling at you several times before. You're glad the bot notices little things that you usually overlook. You chat about your impressions of the other woman. How old might she be? What kind of job does she have? And, you are happy the forthright social shopper tells you that no one noticed how nervous you were in this situation. After all, your bot is equipped with top-of-the-line emotion recognition. It's funny because one cannot be mad at it for not following social conventions and just naïvely making itself heard, even though it is pretty smart after all.

The concepts outlined here focused on making use of robotic superpowers to create a different shopping experience through newly envisioned robots, thereby making a positive impact on current practices. We believe that adding more insights from, for example, employees of a supermarket, could have led to even more diverse ideas. After all, a supermarket is a complex environment with multiple stakeholders (not only the consumer) who would be affected by the introduction of a robot.

In sum, the possibility-driven approach of utilizing robotic superpowers is promising and inspiring, because it helps to open up the

design space and create different concepts that are focused on new and positive experiences. In particular, comparing the different skills and abilities of humans and robots can engender concepts which lead to the creation of meaningful experiences with social robots. Also, rather than simply replacing humans with robots, it facilitates the development of ideas for beneficial new robots whose special abilities would complement those of their human co-workers. While at times the resulting ideas might still seem vague and hard to implement, they can provide valuable starting points for development and catalyze discourses about the possible roles of robots in different contexts.

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