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The politics of imaginary technologies: Innovation ecosystems as political choreographies for promoting care robotics in health care

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Abstract
This chapter discusses strategies and innovation ecosystems of care robotics as political choreographies that promote emerging technologies by speculating about and offering imaginary futures of health care. Since the most promising care robots are still at the prototype stage, it is justified to call multitasking care robots 'imaginary technologies'. My hypothesis is that many academic actors have embraced a societal goal of advancing the utilisation of robots in social and welfare services, acting as prime movers in innovation ecosystems. Using recent examples from the care robotics literature and media texts, I introduce two types of interventions through which researchers participate in the process of domesticating care robots in health care and, through this, also construct innovation ecosystems. I suggest that instead of staying in a 'neutral position' with respect to these technologies, the intention of these researchers is to intervene and change prevailing care practices.

Keywords: imaginary technologies; political choreography; care robotics; innovation ecosystems; media; wilful blindness

Introduction

Almost a quarter of a century ago, an American robotics guru, Joseph Engelberger (2000), envisaged that a multitasking robot that could care for older adults in home environments would be developed and manufactured soon. To promote this vision, he travelled around the world in the mid-1990s to motivate research teams to embark on his mission towards designing the 'Elderly Caregiver', a personal robot assistant for everyday tasks (Pransky, 2018). Inspired by Engelberger's vision, several robot prototypes have been developed, including Fraunhofer IPA's care robot platform called Care-O-Bot 1 in 1998, SCITOS A5 by METRA-labs in 2010, the Hector robot in 2012, the Hobbit in 2015, the RobuMate robot in 2012, and IFN Robotics's prototype called Ruby in 2018.[1] It seems that neither of these robot prototypes has so far led to commercial solutions in the consumer market beyond research purposes. One of the exceptions is the Wakamaru domestic robot, which was launched by Mitsubishi in 2005. Unfortunately, the Mitsubishi company failed to sell a single robot.

Despite the high expectation that AI-driven robots will revolutionise human care, the role of robots in care has, so far, remained marginal in nursing. Monitoring devices, automatic medicine dispensers, robotic pets, mobile telepresence equipment, and hospital logistics are already in use, but they are only capable of simple, colloquial interactions or modest repetitive tasks, not multitasking assistance in daily activities (van Aerschot & Parviainen, 2020). One of the main technical bottlenecks in developing useful robots for home care and nursing homes is the lack of sophisticated robotic limbs that could help older people with dressing, bathing, and toileting. Thus, it is justified to call multitasking care robots 'imaginary technologies' since the most promising care robots are still at the prototype stage.
With the help of national and international policy programs – so-called "white papers" or roadmaps – R&D funding is channeled for the development of care robotics that is believed to be important in solving social issues, such as, problems related to the ageing of the population (e.g. Government of Japan, 2007).

White papers and robot roadmaps remain only declarations without an active group of participants involved in the process of the domestication of imaginary technologies. Compared to the domestication of existing technologies by households (Silverstone & Hirsch, 1992), this discursive domestication process (Hartmann, 2020) aims at preparing people and environments for emerging technologies in advance: by creating positive images of these technologies in public, conducting surveys on care robots, providing information to those who will deploy these technologies, and intervening to change the prevailing practices in which the emerging technologies could be embedded within existing systems. In managerial rhetoric, this is called building up 'innovation ecosystems' that should boost different actors to find a functional goal enabling technological evolution (Jackson, 2011). The actors of ecosystems include the material resources (funds, equipment, facilities, etc.) and the human capital (industry researchers, academic scientists, students, faculties, industry representatives, etc.) that together make up the institutional entities participating in an ecosystem (Niemelä et al., 2021).

Building innovation ecosystems around emerging technologies is under the control of governments, tech giants, and interest groups, though the impression created of innovation ecosystems is that they are more local than global, self-organising and self-sustaining

[1] All these prototypes are mobile assistive robots, designed for smart home environments to advance wellness and quality of life for seniors. Fraunhofer IPA's latest version of its platform, Care-O-Bot 4, was launched in 2015. Both Care-O-Bot 4 and SCITOS A5 are available for research and development (R&D) projects only.

networks that gather business and R&D under trendy hubs to nurture innovations. This ostensible independence is an essential feature because, otherwise, it would be difficult to integrate, for example, universities and academic research into the business objectives of ecosystems. To avoid managerial rhetoric and to discuss the power structure of these systems, I classify innovation ecosystems as 'political choreographies' to better capture their global scale and their strategic practice of steering business decisions. Inspired by assemblage thinking, the notion of political choreography is understood as a network that gathers actors and resources around imaginary technologies, creating value for its participants (Parviainen & Coeckelbergh, 2020). The concept helps us to understand the performative strategies that different types of actors involved (e.g. research projects, universities, start-ups, investors, media, etc.) in innovation ecosystems use to promote their agendas around care robotics.

The politics of imaginary technologies has enabled us to address the more-than-instrumental role of technologies to clarify the proactive strategies of innovation ecosystems. Innovation ecosystems need performative tools, such as raising hype in media, to strengthen the network's ability to shape public opinion in a way that is favourable to robots. Consequently, the performative acts of innovation ecosystems help to channel venture investments and R&D funding to care robotics, promoting the robotisation of human care. This also means that not all actors involved in ecosystems are fully aware of their role in this network, and the performative tools of ecosystems never have full control over the actors. Nevertheless, the media spectacle of the Sophia robot has shown that robotics does not need to be mature for the consumer market as long as its performative function reassures investors of its future potential in developing AI-based robotics (Parviainen & Coeckelbergh, 2020).

My hypothesis is that many academic actors in the R&D field of care robotics have embraced a societal goal of advancing the utilisation of robots in social and welfare services, thus, acting as prime movers in innovation ecosystems. Using recent examples from the care robotics literature, I analyse two types of interventions in which research projects contributed to the domestication of care robots in nursing. The first intervention is care robot acceptance studies, which focuses on caregivers', patients', and citizens' attitudes towards robotics based on hypothetical scenarios, images, or narratives. The second is press releases by scientists in which preliminary research findings are described and revolutionary promises are made, generating robot hype in the media. Both interventions are also closely interwoven. My understanding is that many scholars leading such projects have taken a proactive approach to changing care infrastructures and practices so that new technologies can be introduced into the healthcare system rather than taking a neutral or critical stance towards these technologies.

Acceptance research promoting the robot invasion in nursing

Robot acceptance models are developed to explain and evaluate the intention to use a particular type of technology, including robots (e.g. Holden & Karsh, 2010; Hebesberger et al., 2017). One central dimension in acceptance is social acceptance, which is defined as individuals' willingness to integrate a robot into everyday life, emphasising the importance of detecting reasons why people accept or reject robotic systems in their environment and what attitudes they express towards robotic aids (Weiss et al., 2011). Regarding care assisting robots, acceptance studies focus on either evaluating citizens'/patients'/clients' attitudes towards robots (e.g. Bedaf et al., 2018; Hebesberger et al., 2017; Johnson et al., 2014; Körtner et al., 2014; Khosla et al., 2017; Louie et al., 2014; Smarr et al., 2014; Stafford et al., 2014; Takanokura et al., 2021) or how caregivers and professionals accept or reject robotic systems in their working environments (e.g. Bedaf et al., 2018; Coco et al., 2018; Rantanen et al., 2018; Yuan et al., 2022; Wolbring & Yumakulov, 2014). In the case of older adults, most of these studies come to the conclusion that seniors have positive attitudes towards socially assistive robots (e.g. Bedaf et al., 2018; Bettinelli et al., 2015; Hebesberger et al., 2017; Louie et al., 2014). Furthermore, older adults are especially open to using robot assistants if they perform home-based tasks, such as housekeeping, laundry, and offering medication reminders; manipulate objects, such as finding, fetching, reaching for items, or opening and closing drawers; or information management (Smarr et al., 2014). Seniors have shown that they are more willing to accept the presence of the robot than are their caregivers, relatives, or health care professionals (Bedaf et al., 2018).

Of the acceptance studies mentioned above, only two of them (Takanokura et al., 2021; Bettinelli et al., 2015) are based on robots available in the consumer market and create more or less realistic settings in which robots are seen and used as part of care practices. Typically, studies on acceptance are based on research designs in which researchers show images or video of real or imaginary robots (D'Onofrio et al., 2018; Pino et al., 2015), provide narratives or descriptions of robots (Coco et al., 2018; Hall et al., 2019; Pew Research Center, 2017; Rantanen et al., 2018; Smarr et al., 2014), or test robot prototypes to elicit respondents' opinions of care robots (e.g. Chen et al., 2017; Khosla et al., 2017; Pino et al., 2015). In some robot acceptance studies, the Wizard of OZ (WOZ) technique is used to simulate imaginary conditions where participants can feel as if a robot responds to their speech or movement in real-time on screen or in labs (Kim et al., 2013). Using the WOZ technique, the robot's movements and speech are steered on the laptop by the operator as if the robot were moving autonomously to induce participants to interact with and pay attention to the robot.

What do these studies say about the use of care robots in the real world? Almost nothing. Some researchers mention the technical limitations of available care robots; for example, in Bedaf et al. (2018), 'the robot in its current form was found to be too limited and participants wished the robot could perform more complex tasks' (p. 592). In addition, there are very few acceptance studies in which robotic devices are compared to conventional technologies to determine the former's effectiveness in completing the examined tasks (Bettinelli et al., 2015). Hardly any researchers mention reasons why research designs are almost impossible to arrange to provide solid empirical evidence based on a comparative longitudinal study.

The main reason for the absence of such solid evidence is that there are very few care robot types available on the market. It is likely that research teams would acquire care robots for experiments if affordable and functional equipment were available. The strange thing is that scientists remain silent on this fact in their analyses. An overview of the development and sales figures of the global service robotics market in recent years clearly reveals the current situation. Though there are no separate statistics on care robotics, by looking at the value of world trade in service robots for personal and domestic use, we can outline the volume of robots produced to care for older people (International Federation of Robotics [IFR], 2020a). According to the IFR's recent report, the worldwide sales of assistance robots for older adults or handicapped persons was only US$91 million in 2019 (IFR, 2020b). For instance, the value of Finland's exports of health technology products alone was 2,400 million (2.4 billion) euros in 2019 (Niemelä et al., 2021).

I am particularly interested in the question of why robot acceptance research is being conducted in huge volume, even though the field of care robotics is not mature enough to provide a reliable picture of its acceptability. For instance, a simple search for 'care robot acceptance' returned 85,000 results on Google Scholar in March 2022. While some of these results may be from non-refereed articles, several are peer-reviewed academic studies. The volume of care robot acceptance studies has begun to produce a growing number of meta-analytic reviews, generating a new level of speculation (Holt-Lunstad et al., 2015; Shishehgar et al., 2018).

I want to emphasise here that these peer-reviewed academic studies on care robot acceptance meet scientific research criteria, so I do not question their methodological reliability. Instead, I am interested in how acceptability research is used to create tools for transforming people's opinions and perceptions of robots so that robots can be implemented in health care in the future. There are at least two strategies. First, acceptance studies provide valuable information to robotics designers about what kind of software and design solutions inspire users' trust in these devices. Second, these studies produce tools for management to persuade people to use robot-driven services over human-based services. That findings from acceptance studies are used to persuade users becomes evident in the descriptions of research purposes and findings when scientists state, for example, 'we investigated how to increase people's acceptance of a social robot by considering the concept of social distance' (Kim et al., 2013, p. 1091), or 'These findings contribute to our understanding of how elderly users accept assistive social agents' (Heerink et al., 2010, p. 361).

A more worrying feature is related to blurring the line between existing technologies and imaginary technologies in health care (Parviainen & Koski, forthcoming). The speculative field of research on the acceptance of care robots—producing research results in a huge volume—easily generates the impression that care robotics devices are already widely used in elderly care. The creation of such a distorted image is hardly deliberate, but rather an unintended consequence of the amount of research on this subject. Although the ignorance of researchers may not be intentional, their attitudes can be associated with 'wilful blindness' regarding the fact of how few robotic devices are available on the market. By wilful blindness I mean a process of detachment in which some aspects of reality become or remain invisible or irrelevant to researchers (Bovensiepen, 2020). As the field of robot acceptance has become established independently, researchers do not consider it necessary to rethink the rationale for their research. So, I assume that some researchers and their projects involving speculative studies of robot acceptance are conducted to develop innovation ecosystems as actors. They participate by either consciously or unconsciously promoting robot invasions rather than taking a critical stance on whether it is economic, ecological, or humanly reasonable to prepare care service infrastructures and to educate health care professionals to be ready for speculative care robotics in the future.

Press releases by scientists in care robotics

Press releases have served as a major source of story ideas for science journalists in both traditional and new media environments. Scholars in critical media research have complained that the media produce sensationalism and highlight controversy over the coverage of science rather than addressing topics of scientific consensus (Brown Jarreau, 2014). However, while scientists often blame the media for focusing on controversy in some cases—most recently regarding research on COVID-19—press releases by scientists about their research projects are shown to be a major point of distortion in the translation of science from research findings to media stories (Brechman et al., 2011). Sensationalism in press releases gives newsrooms novel and controversial topics to report on, but press releases reporting on science by highlighting preliminary or controversial results can lead to distorted perceptions of science (Schwartz et al., 2012).

Brown Jarreau (2014) states that scientists are under increasing pressure to promote academic research in public by issuing press releases. A number of Internet news sites have made science press releases more visible and accessible not only to professionals, but also to lay readers through social media and blogs. Many scientists are increasingly practicing writing for the lay reader and packaging press releases with images, graphics, videos, and headlines designed to help spread the story via traditional and social media. Media visibility is also important because competition for research funding also requires publicity. Many of the press releases never cross the news threshold, but there are a few that draw the attention of journalists and news rooms, including a few cases in the field of social robotics, such as the bear-shaped Robear and the Sophia robot.

The Riken-SRK Collaboration Center for Human–Interactive Robot Research in Japan began its press release on the bear-shaped robot with the following sentences on February 15, 2015:

> Scientists from RIKEN and Sumitomo Riko Company Limited have developed a new experimental nursing care robot, ROBEAR, which is capable of performing tasks such as lifting a patient from a bed into a wheelchair or providing assistance to a patient who is able to stand up but requires help to do so. ROBEAR will provide impetus for research on the creation of robots that can supplement Japan’s need for new approaches to care-giving. (Riken, 2015a)

The Robear robot—based on earlier versions of Riba-I, announced in 2009, and Riba-II, developed in 2011—was said to be lighter than its predecessors, weighing just 140 kilograms, to incorporate a number of features that enable it to exert force in a gentle way. Professor Toshiharu Mukai, leader of the robot team, said: ‘We really hope that this robot will lead to advances in nursing care, relieving the burden on care-givers today. We intend to continue with research toward more practical robots capable of providing powerful yet gentle care to elderly people’ (Riken, 2015a). The press release spread widely in the international news platforms. Robear quickly achieved an iconic status as a patient transfer robot that could solve care problems for older people in the future. For example, *The Guardian* titled a story based on a press release: ‘Robear: The Bear-Shaped Nursing Robot Who'll Look after You When You Get Old’ (Dredge, 2015). *The Mirror* titled its story: ‘Robot BEARS Could Replace Nurses–‘Robear’ Combines a Friendly Face with Heavy Lifting Power’ (Solon, 2015).

Just a month after the Riken (2015a) press release was sent, the Riken Center for Research on Human–Robot Interactions, which developed the robot, was closed on short notice; the statement read: the ‘Riken-TRI Collaboration Center for Human–Interactive Robot Research (RTC) finished its scheduled research term and dissolved at the end of March 2015’ (Riken, 2015b). Professor Mukai moved to Meijo University, where he has continued to develop the Robear platform, albeit with much more modest goals. The development and commercialisation of the lifting robot Robear has apparently been abandoned. It is likely that at the time of the February press release, the threat of closing the research centre was already known. The international press did not report this turn in Robear’s development work. In 2018 *The Guardian* stated that ‘Japan lays groundwork for boom in robot carers’ (Hurst, 2018). The illustrated photo within the 2018 story by *The Guardian* showed a Japanese robot prototype, ‘Robear’, lifting a woman for a demonstration at Riken-TRI in Nagoya.

The robot as the saviour of the ageing crisis in industrialised countries seemed such a captivating story that the media has begun to recycle the story without checking the facts. Reporters have remained silent on the weaknesses of robot prototypes and the fact that few care robots are used in nursing. The ‘robot as saviour’ theme has a special kind of news value on which journalists like to focus in their story selection. Humanoid robot figures, familiar from sci-fi movies, have sparked positive perceptions among readers such that robots will soon be used in senior care in some countries, particularly Japan. The Finnish broadcasting company YLE, for example, has repeatedly claimed in its news that robots will soon assist older people in Japan. Although social robots, such as the humanoid robots Zora/Nao or Pepper, cannot yet conduct physical and concrete care tasks, including dressing, bathing, and toileting, they are used to illustrate news about providing basic care services for seniors. *The Guardian* reported in 2016 ‘how a robot could be grandma’s new carer’, using the toy robot MiRo in its illustration (McMullan 2016). In 2017, the *BBC News* declared that academics say that ‘robots could help solve the social care crisis’, using the Pepper robot as an example (Richardson, 2017). None of these robot types have the fine motor ability to assist older people in their daily activities.

The Japanese government, in collaboration with the nation’s tech industry, has been actively creating a positive image of Japanese robotisation using humanoid robots. The Innovation 25 roadmap of 2007, developed by Prime Minister Shinzo Abe and his cabinet, aimed to reverse the country’s declining birth rate by 2025 by highlighting the key role of the nuclear family in reforming Japanese society (Government of Japan, 2007). Innovation 25 sought to address both birth and ageing issues through robotics and technology. The future Japanese family featured in the Innovation 25 roadmap included a mother, a father, two children, and a grandmother and grandfather. The newest member of the family was a household robot, Inobe-Kun, which took care of housework and assisted the older grandparents. Jennifer Robertson (2018) called the vision of the Innovation 25 roadmap retro-futuristic because the family model appeared to reproduce sci-fi fantasies together with conservative notions of the nuclear family from the 1950s.

The media have played a pivotal role in publicising care robot developments to advance the initiatives of care robot innovation ecosystems towards the future of humanoid robots in care (van Aerschot & Parviainen, 2020; Parviainen & Coeckelbergh, 2020). However, journalists are not necessarily fully aware of their performative role in this network as they promote care robotics as imaginary technologies. Taking a strict view, providing highly speculative information about care robots could even be called *misinformation* if the audience were to judge these depictions as providing a credible image of future care. From an epistemological perspective, misinformation is understood as false or inaccurate information that is communicated regardless of the intention to deceive (O'Connor & Weatherall, 2019). Certainly, the present study cannot show that press releases like the story about the Robear have advanced public misunderstanding of care robot capabilities in human care. Still, there is a need for scholars to research the effects of these science press releases. So far, the aspects of scientific press releases that influence journalists' interests and later public understanding of phenomena (and how they accomplish this) have remained unknown.

Scientists and research teams that issue press releases on their robot experiments can create intentionally or unintentionally high expectations of care robots by building up hype around care robotics. Their goals can strengthen the network of innovation ecosystems to acquire new resources for R&D work and shape public opinion in a way that is favourable to robots. However, they can also be partly blamed for strengthening skewed images of the capabilities of care robots. In transmitting news on robot experiments, journalists should make it clearer, such as in the case of the Robear robot, that this type of robot prototypes may never end up in consumer use. It can be considered misleading to present care robots as a solution for responding to the care needs of the growing elderly population when the available devices are mostly interactive robotic pets. Social robots, automatic medicine dispensers, or floor cleaners can hardly help to solve the massive social, ethical, and economic problems created by the diminishing resources and growing care needs of the ageing population.

Conclusion

Looking beyond the rhetoric of innovation ecosystems, this chapter has revealed some aspects of how scientific research and its performative communication are connected to promote the acceptance of care robotics in nursing. Using the term political choreography has enabled us to draw attention to the performative undertaking of innovation ecosystems to draw new R&D funding for the development of care robotics and to create hype to overcome public resistance to the equipment. The performative acts of innovation ecosystems, with help of the media and other actors, channel venture investments and R&D funding to care robotics, promoting the robotisation of human care.

The chapter suggested that the performative roles of scientists and journalists in promoting care robots as actors in innovation ecosystems are not necessarily deliberate but related to their own wilful blindness. As the research on robot acceptance has become established in its own field, it is necessary for scholars to underline that their empirical results are highly speculative and that they discuss mainly imaginary robots or prototypes. The wilful blindness of journalists is related to their failure to check the facts about care robots; as a result, they recycle speculative promises in the media that are distributed by researchers in press releases. This highly speculative information about care robots could even be called misinformation if the public takes it as a credible picture of the current state of care robots.

So far, the novel field of robot ethics in elderly care has focused on concerns over the effects and impacts of robot care for older people and care professionals in the future. The ethical discussions have so far remained speculative in nature and try to address the positive and negative potential of robotics: the potential to become socially isolated, the risk of ageist discrimination, and the possibility of losing or gaining one's own autonomy or opportunities for self-growth. My suggestion is that critical attention should also be directed at political, economic, and ecological realities of organising care and at the interests behind developing technological commodities. It is time to openly discuss the drivers of care robot initiatives to outline the bigger picture of organising care under conditions of limited resources. The political choreographies framework offers a helpful lens to discuss how critically proactive strategies create hype around care robotics to overcome potential resistance to equipment.

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