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Chapter 13

'In the Future, as Robots Become More Widespread'

A Phenomenological Approach to Imaginary Technologies in Healthcare Organizations

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Abstract: This chapter discusses imaginary technologies that do not exist yet but are expected to be implemented in clinical work in the near future. Adopting a phenomenological view on the politics of organizational time, we illuminate how the rhetoric of futurity and protentional anticipation dominate managerial acts in healthcare organizations. This future-oriented management includes strategies of risk assessment, investments in emerging technologies, and other actions to reduce external uncertainty and move towards an enhanced capacity to cope with potential challenges. However, we suggest that potentially harmful consequences of emerging technologies cannot be established reliably in advance by investigation, experiments, and risk assessments. The phenomenological notion of embodied information infrastructure allows us to consider how visions of complex technologies intertwine with clinical practices in healthcare professionals' work. We use two examples of imaginary technologies—automated decision-making systems and care robotics—to concretize how the line between imaginary technologies and existing technologies becomes increasingly volatile in healthcare organizations.

Keywords: imaginary technologies, organizational time, futurity, temporality, protentional anticipation, healthcare organizations, automated decision-making, care robotics, embodied information infrastructure, phenomenology

13.1 Introduction

Temporality is an essential element in the functioning of all organizations and their institutional environments (Butler, 1995; Fleischer, 2013). In phenomenological approaches to time in organizations, temporality is frequently understood as the medium and the conditions of organizational practices (Chia, 2002; Langley & Tsoukas, 2010). Adopting a processual lens of temporality, organizational phenomenologists have explored the flow, fluidity, repetition, rhythms, cycles, and long- and short-term temporal activities in organizations related to the character of changes (e.g. Langley et al., 2013). Inspired by Husserl’s (1991), Heidegger’s (1996), and Merleau-Ponty’s (1989) views of time, phenomenological discussions on organizational time have stressed the embodied and experiential qualities of organizational life, addressing differences between subjective and objective time spans.

So far, the politics of organizational time have attracted little interest among organizational phenomenologists, although the time window created by crisis situations, for example, is often used effectively in the implementation of managerial reforms in organizations (Fleischer, 2013). A politically oriented phenomenological perspective on organizational time is needed to illuminate the dynamics of temporal relationships, interdependencies, and embeddedness that concern anticipation in organizations. In Husserl’s phenomenology, anticipation is called ‘protention’ and refers to 'immediate anticipation' of what will be perceived 'soon'.[1] Applying Husserl's concept in the institutional and political context, we use the term 'protentional anticipation'. When protentional anticipation, such as reaching out into the future, becomes a normalized condition, it can be understood as forming a new layer of the unconscious organizational structure and its politics. When protentional anticipation dominates the functions of postmodern organizations, most people do not necessarily notice how managerial acts are primarily intended to control the future. From the managerial perspective, the central aspect of organizational time is future orientation that includes strategies of risk assessment, investments in emerging technologies, and other actions to reduce external uncertainty and move towards an enhanced capacity to cope with potential challenges. Adopting emerging technologies at an early stage and participating in their development have been seen as key solutions to handling an uncertain future in public organizations as well. The future horizon set by emerging technologies is not just a random factor in the operation of organizations; rather, the promise of a 'better future' is largely a built-in feature in all new technologies.

We assume that protentional anticipation has become a common state when it comes to the regimes of technology politics that are shaping innovation and technological investments in public organization. Discussing temporal modalities, Barbara Adam (2009) suggests that the domain of the 'not yet', which she calls 'futurity', has become the main capacity to create and control modern politics. If we consider Adam's argument from a technology perspective in healthcare

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[1] Husserl's (1991) discussion of temporality includes two key concepts—'retention' and 'protention'—that describe the fluidity of past, present, and future in intentional acts. While retention is the process whereby a phase of a perceptual act is retained in our memory, protention is our anticipation of the next moment. Retention is a presentation of that which is no longer before us and is distinct from immediate experience. Thus, the present is registered in a short moment of sense perception between retention and protention. Husserl's original analysis focuses on retention, and his discussion of protention is less developed (Gallagher, 2017).

organizations, the regime of futurity is strongly linked to imaginary technologies and technological visions in medicine and nursing. Piloting artificial intelligence (AI)-based tools and care robots have been used extensively in healthcare in recent years. According to Accenture's (2020) report, 69% of healthcare payers and providers have been involved in experiments. Still, only a few solutions are implemented in healthcare practices. Thus, it can be argued that AI and care robotics in healthcare are still, in large part, extended 'imaginary technologies'.

From the historical perspective, novel technological solutions have often followed the imaginary technologies of science fiction, materializing authorial imagination decades later (or longer; Jasanoff & Kim, 2015). In Mary Shelley's novel, published in 1818, Dr Frankenstein famously reanimates dead flesh by manipulating muscles with electricity. The defibrillator that sends a high-energy electric shock through the heart was invented by electrical engineer William Kouwenhoven in 1930. Admittedly, not all imaginary technologies in science-fiction stories have materialized successfully, despite many attempts. *The Jetsons*, an animated TV programme from the 1960s, included a robot maid named Rosie who completed regular household tasks, such as cleaning, cooking, and selecting clothes for the family members. Rosie served as a role model for the Wakamaru domestic robot, which was launched by Mitsubishi in 2005. Unfortunately, the Mitsubishi company failed to sell even one of its robots. Still, the visions of new technologies created by science-fiction literature and film are reflected in the ways in which innovation and research activities in new technologies are developed (Jasanoff & Kim, 2015).

Imaginary technologies are related to 'sociotechnical imaginary', the concept made famous by Sheila Jasanoff. Socio-technical imaginary refers to imaginary futures that states or unions of states hope to achieve with technological development. Jasanoff & Kim posit: 'As an analytic concept, "sociotechnical imaginary" cuts through the binary of structure and agency: it combines some of the subjective and psychological dimensions of agency with the structured hardness of technological systems, policy styles, organisational behaviors, and political cultures' (Jasanoff &

Kim, 2015: 35). Policy programmes based on socio-technical visions influence technological design, channel public budgeting, and justify the needs of citizens in terms of technology. They are national or transnational strategies and visions for the future that guide massive technology and science programmes. The recent national and multinational strategies for robotics and AI, so-called 'white papers' or roadmaps, are recent examples of the socio-technical imagination formulated. Langdon Winner reminds us that equipment and technologies should be assessed not only for their efficiency and productivity, but also for how they are constructed through power and authority. While technological innovations are understood as a key governing force in society, 'what matters is not the technology itself, but the social or economic system in which it is embedded' (Winner, [1980] 2010, 20).

This chapter discusses the kinds of challenges that imaginary technologies place on healthcare organizations related to care robotics and automated decision-making (ADM). We use the term 'imaginary technologies' to consider how strategies for robotics and AI guide expectations of how medical assessments and nursing work will be performed in the future. It is essential to recognize that existing technologies cannot yet achieve the goals set out in the visions. Instead, imaginary futures based on robotics and AI will help justify new investment in research and development (R&D) projects and the digitization of the public sector, which in turn is believed to strengthen the state's ability to responsibly provide public goods.

Despite the expectation that robots will revolutionize human care, the role of robots in care has, so far, remained marginal. One of the indications of this limited role is the very small figures for the world trade of service robots. According to the International Federation of Robotics's (IFR) recent report, the worldwide sales of assistance robots for elderly or handicapped persons was only US$91 million in 2019 (IFR, 2020). Since the most promising care robots are still in the prototype stage, it is justified to call care robots imaginary technologies. In this discussion, we suggest that this imagination is not neutral but puts pressure on healthcare professionals, organizations, and their development.

Many healthcare professionals and experts agree that AI has the potential to transform the healthcare industry, but AI-based ADM systems are not seen as mature enough to technically diagnose patient conditions or replace healthcare professionals' judgements (Palanica et al., 2019). IBM introduced its AI platform (Watson) into the healthcare industry in 2011 with high expectations, but very few collaborations between IBM and healthcare institutions around the world have led to commercial products (Strickland, 2019). One of the reasons is that complex AI systems do not fit the messy reality of today's healthcare system (Wachter, 2015). However, the emergence of the Covid-19 pandemic has significantly advanced collaboration between healthcare organizations and the technology industry to scale up solutions based on complex algorithms used in chatbots (Parviainen & Rantala, 2021). Medical experts have been concerned about the situation, identifying many risks with the use of AI-based tools in healthcare, including patient safety, trust, transparency among participants, data use, privacy, and integration problems with technological systems in other healthcare institutions (McGreevey et al., 2020). One of the biggest threats is that the large-scale deployment of AI-based applications could push healthcare into systemic change in which a domino effect brings about massive changes across the system.

Central to the politics of protentional anticipation in organizations is the possibility of moving away from current problems within an organization by shifting rhetoric towards the positive promises and manageable risks of emerging technologies. Typically, managerial rhetoric emphasizes 'known unknowns' in terms of risks, which refers to the ability to identify and control the unknown. However, researchers have begun to recognize that potentially harmful consequences of emerging technologies cannot be established reliably in advance by investigation, experiments, and risk assessments (cf. Böschen et al., 2010; Gross, 2019). This applies in particular to the deployment of technologies with significant potential for systemic change. In the literature on ignorance, this type of situation is characterized as ‘unknown unknowns’, or *nescience*, and has traditionally been considered outside the scope of risk management, only to become known in retrospect (Kerwin, 1993; Gross, 2019; Parviainen, Koski, & Kuusipalo, forthcoming). In this sense, the real benefits or serious problems of large-scale deployment of AI can become apparent when or if these systems have been implemented in socio-technological practices.

The chapter is organized as follows. Focusing on ADM and care robots as imaginary technologies in healthcare, we shed light on how phenomenological conceptualizations in organizational contexts can be useful in understanding the complexity of unknowns that emerging technologies bring to organizations. First, we introduce a phenomenological notion of information infrastructure and discuss how technological devices are employed in work. Challenging neutral and external perspectives on technology we consider bodily dimensions within technological systems. In the next section, we consider how AI-based systems are believed to be able to automate the complex judgement of physicians and what kind of pressure this puts on physicians’ work. Then, we discuss how the repetitive and difficult labour tasks of nurses are to be replaced by care robots. Through the examples provided, we concretize how the line between imaginary and existing technologies becomes increasingly volatile in healthcare organizations.

13.2 The Phenomenological View of Embodied Information Infrastructures in Organizations

In traditional engineering, technology is frequently treated as neutral instruments and tools not dependent on human goals, intentions, interests, or power relations. The phenomenological discussions on technology, including those offered by Winograd & Flores (1986); Dreyfus & Dreyfus (1986); Introna, Ilharco, & Faÿ (2008); and Viscusi et al. (2012), have challenged the many conceptualizations of information technology as formal systems and external, neutral tools in organizations. Technology shapes society and its institutions, not only on the macro level but also on the micro level, modifying embodied practice and relationships with other beings. Winograd & Flores's seminal perspective on computers in the work context before the internet era indicated how the implementation of equipment produces new social embodied practices in organizations. They stated,

> The computer, like any other medium, must be understood in the context of communication and the larger network of equipment and practice in which it is situated. A person who sits down at a word processor is not just creating a document, but is writing a letter or a memo or a book. There is a complex social network in which these activities make sense. It includes institutions (such as post offices and publishing companies), equipment (including word processors and computer networks, but also all of the older technologies with which they may coexist), practices (such as buying books and reading the daily mail), and conventions (such as the legal status of written documents).
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> (Winograd & Flores, 1986: 5–6)

Applying Martin Heidegger's existential phenomenology, Winograd & Flores recognized the revolutionary impact of computers on work and interpersonal relationships in organizations. Using Heidegger's concept of being-in-the-world highlights how humans are always already immersed within specific socio-material worlds and their practices, namely, within relational ensembles involving people, objects, and tools, which give meaning to what they do and who they are (Sandberg & Tsoukas, 2015). After Winograd & Flores, many phenomenologists have criticized the ways in which management systems and leadership are implemented through information systems so that both management and technology appear as a neutral system (Ciborra, 2004; Viscusi, Campagnolo, & Curzi, 2012; Tomkins, 2020; Aroles, Vaujany, & Dale, 2021). Ciborra (2004) criticized the strategies of information and communication technology (ICT) in organizations whose main principles are to accelerate data and to redesign business processes at the expense of meaningful work and the well-being of employees. He shows how taking a phenomenological approach in considering ICT in organizations allows us to challenge reified notions in technological systems (Ciborra, 2004).

The adoption of a ‘phenomenological stance’ allows us to go beyond the traditional idea where ‘neutral’ ICT tools (computers, mobiles, social media platforms, etc.), work tasks, managerial acts, and professionals are seen as different but intersecting phenomena. A post-phenomenological discussion of technology, inspired by Don Ihde’s philosophy, has emphasized the mediating role of technological artefacts in the sense that the interplay between humans and the world grants things the degree of independence that artefacts deserve (Verbeek, 2005). Technical mediation is localized precisely in these relationships. However, one of the challenges posed to this post-phenomenological stance is the current forms of digitalization—complex algorithms and data are rooted in the information-intensive work where data are produced in the practice, during the practice, and for the practice itself. Data as both technical mediation and artefacts are increasingly controlling the ways in which relationships between people and objects are shaped. As digital devices and the complex algorithms of applications and their data collection dominate people’s daily lives, it becomes increasingly difficult to identify what artefacts are and what the technical mediation is between them and people. It seems that embodied practices and digital devices form a complex ‘messy’ living system without any clear borderlines.

Since the current environment of information technologies is constructed as a complex comprehensive living and knowing habitat in work organizations, it makes sense to discuss ‘information infrastructure’. Changing the perspective from networks, relationships, and systems to infrastructure allows for a global and emergent perspective on technologies and information systems in organizations. Ciborra & Hanseth define information infrastructures in organizations in the following way: ‘Information infrastructures can, as formative contexts, shape not only the work routines, but also the ways people look at practices, consider them “natural” and give them their overarching character of necessity. Infrastructure becomes an essential factor shaping the taken-for-grantedness of organisational practices’ (Ciborra & Hanseth, 1998: 321–2). For this reason, it makes sense to talk about ‘embodied information infrastructures’ in which corporeality is inherent in part of the formation of infrastructures (Parviainen & Ridell, 2021). This also means that information infrastructure not only concerns material artefacts but also embodied habitual practices and routines. Lived bodies, intentionally and unwittingly, individually and jointly, are shaped by and contribute to information infrastructures in work spaces. Thus, for instance, embodied practices formed through computer-aided desk jobs cannot be detached from the power of global information infrastructure (Parviainen & Ridell, 2021). This posthumanist stance in information infrastructure faces the dilemma that has been central in the (classical) post-phenomenology, namely, the human-centred idea that the lived body is the centre of the world of perception (e.g. Merleau-Ponty, 1962). Some phenomenologists might find uncomfortable the idea that artefacts are not treated as the environment for lived bodies but that they have been seen to have agency when, for example, algorithm-driven social media platforms influence users’ voting decisions in elections.

In an information-infrastructure-based approach, we explore how these particular technologies embed a view of interaction, society, and organization that may challenge core assumptions of human-centred notions of technology. Thus, current information technology is characterized, as Kallinikos (2012: 69) puts it, ‘by its remarkable ability to deeply penetrate the social fabric and increasingly induce the framing of life issues in terms of data availability, and sensemaking based on data, assembled into meaningful categories and structures by machines’. Furthermore, we aim to identify and exhibit the generic attributes of a work environment, including healthcare organizations, that cut across specific contexts of social and institutional life, namely, the prominence of cognition over perception and the preponderance of information and computational principles in defining reality, as in the case of ADM. The computational principles define the unedited role of representations as outcomes of technological advances of complex algorithmic systems far beyond any human capacity.

While non-human agents play a key role in information infrastructure, this does not mean that human experiences, feelings, or corporeality have become irrelevant. One of the key aspects of the phenomenological approach to information infrastructure is that it highlights unique relations with space, temporality, embodiment, and materiality. Thus, it differs from Latour's (2005) and his colleagues' principal idea of Actor-Network Theory (ANT). ANT grants human and non-human actants equal amounts of agency within webs or actor networks. The core of this theory is the principle of radical symmetry between human and non-human actors, which dissolves modernist demarcations between, on the one hand, living, consciously acting subjects and, on the other, merely instrumental deaf-mute objects (Müller & Schur, 2016).

In the phenomenological approaches, material things become meaningful to us within an intelligible ensemble of other meaningful things (Spinosa et al., 1997; Küpers, 2017). Orlikowski (2007) has stated that 'bodily-mediated socio-materialities' play a key role in how human agents, objects, and practices come together. For a surgeon in an operating room, instruments, equipment, and specialized colleagues are not a set of externally related objects, but a meaningful, cohesive entity whose joint efforts can lead to a successful operation. In post-bureaucratic organizations, labour processes have been thought to depend upon a 'collaborative community', which is a new kind of social bonding emerging between collaborating actors, for example, in teamwork and in co-creating activities enabling innovation (Adler, 2015: 452). While demanding cognitive work tasks, such as surgery, are facilitated by support arising from ensembles of meaningful agents, a specific 'tuning-up' effect is needed. From the vitalist, ontology collaboration can be understood as an intercorporeal and intersubjective between-space where pre-cognitive, somatic, and affective attractions and aversions between the collaborators guide the co-acting (Coole, 2007, 2013). Thus, the socio-material environment can also be understood as an affective space in the sense that a special kind of atmosphere, concentration, or affective tuning are required to perform demanding work tasks, such as brain surgeries. Emotions and atmospheres between members of an organization allow them to perform work tasks (or not), to be gatekeepers to knowledge, or to respond (or not) in a certain way.

A further specific aspect of global information infrastructure is that our experience of the here and now in dealing with them has increasingly lost its immediate spatio-temporal referents and has become tied to and contingent on actors and actions at a distance. We are not just talking about remote connection; in terms of temporality, the development of healthcare technologies is determined by many visions of the future and different aspirations about what the technologies are intended to do. Understanding spatio-temporal referents as rooted in emerging technologies provides a way to overcome the above-mentioned ‘neutral view’ of technology and recognize how embodied practices are shaped by the future visions of information technologies at work. Taking these issues into account, we next consider how the deployment of imaginary technologies in healthcare organizations modify working conditions.

13.3 Rationality Drives AI-Based Imaginaries in Healthcare Organizations

Hospitals and healthcare institutions have faced turbulence caused by New Public Management and New Public Governance, bringing managerialism and the notion of patient-centred care forward. Both doctors and nurses have adopted managerial responsibilities besides their medical duties (Martin et al., 2021). Doctors have often resisted the professional hybridization more persistently, while nurses have adopted more easily micro-manageable and various information systems integrated into work processes, which has also increased the power of nurses in healthcare organizations (Rivard, Lapointe, & Kappos, 2012; Carvalho, 2014). Various clinical information systems and electronic medical records (EMRs), which transform the division of work between the medical, nursing, and managing professions, have often first been introduced into organizations under the pretext of economic savings or as a solution for the lack of staffing. Though the line organization model, hierarchically organized and governed by formal procedures in the healthcare sector, has changed in recent years, the rational core of clinical practices has hardly diminished in medicine.

In medical diagnosis and clinical work, one of the main goals has been to develop mathematical and statistical probabilities to achieve optimal medical triage and treatment outcomes. Since the 1950s, there have been efforts to make models for physicians' diagnostic problem-solving and to systematize physicians' medical knowledge (Fischer & Lam, 2016: 24). In the 21st century, AI is expected to improve diagnostics and treatment by developing systems that could automate clinical work. The design principles of statistical probabilities are based on the idea that AI technologies should mimic human decision-making by improving data processing and inconsistencies. These systems are computer programs that are 'programmed to try and mimic a human expert's decision-making ability' (Fischer & Lam, 2016: 23).

In the guidelines, provided by the European Parliament, ADM refers to the process without any human involvement by making a final decision based on the data it receives (Article 29 Working Party (A29WP): 20). Although automated systems in healthcare, such as consulting chatbots, are not reliable enough to be left to operate independently, the pursuit of automation in physicians' diagnostics and treatment can be seen as one form of imaginary technology in the health sector. The European Union (EU) has signalled its willingness to invest heavily in the adoption of AI technologies in the healthcare sector (Ministry of Economic Affairs and Employment, 2017). In a resolution on ADM, the European Parliament noted that it:

> welcomes the potential of automated decision-making to deliver innovative and improved services to consumers, including new digital services such as virtual assistants and chatbots; [it also] believes, however, that when consumers are interacting with a system that automates decision-making, they should be properly informed about how it functions, about how to reach a human with decision-making powers, and about how the system's decisions can be checked and corrected.
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> (European Parliament, 2020: 3)

The usefulness and problems of AI technologies are usually viewed from the perspective of citizens and services, whereas, for example, the effects of AI on the work of professionals are ignored. The AlgorithmWatch Association (2020: 19) criticizes this resolution in its report by saying that, 'throughout the whole document, risks associated with AI-based technologies were more generally labelled as "potential", while the benefits are portrayed as very real and immediate'.

The emergence of the Covid-19 pandemic has significantly advanced the development of telehealth and the use of existing health-oriented chatbots in the diagnosis and treatment of the Covid-19 (AlgorithmWatch, 2020; McGreevey, Hanson, & Koppel, 2020). Before the Covid-19 crisis, discussion about the benefits of ADM in healthcare in general concerned the efficiency that novel emerging technologies could potentially achieve. For instance, in the case of a digital health tool called Buoy or the chatbot platform Omaolo, users enter their symptoms and receive recommendations for care options. Both chatbots have algorithms to calculate input data and become smarter when people use these platforms; they are currently still being developed. More advanced ADM systems in healthcare are promoted by arguments that algorithm-driven systems can free up time for overworked professionals (Topol, 2019), reduce the risk of errors (Paredes, 2018), provide predictive analysis based on historical and real-time data (Pryce et al., 2018), and increase overall efficiency in the public sector (Accenture, 2018). Algorithms are said to make more objective, robust, and evidence-based clinical decisions (in terms of diagnosis, prognosis, or treatment recommendations) than humans can ever provide (Morley et al., 2019).

There are practices of logical reasoning and formal modelling, such as playing chess, that are relatively easy to turn into algorithmic forms. Medical diagnosis is not one of those practices since decision-making requires ‘prudence’, which is regarded as ‘a mode of reasoning about contingent matters in order to select the best course of action’ (Hariman, 2003: 5). Clinicians make diagnoses in a complex manner that they are rarely able to logically analyse (Banerjee, Jadhav, & Bhawalkar, 2009). Phronesis, prudence, and practical wisdom refer to the flexible, interpretive capacity that enables physicians to determine the best course of action when knowledge depends on circumstances (Dreyfus & Dreyfus, 2005; Montgomery, 2006). Experienced doctors as prudential actors are capable of working under the pressure of the complex medical information infrastructure that requires them to follow precise embodied routines and strict ethical standards and to apply the wide pool of scientific knowledge. Powell (2019: 2) explains this by saying that ‘what doctors often need is wisdom rather than intelligence, and we are a long way away from a science of artificial wisdom’.

As the information infrastructure of healthcare is becoming increasingly complex due to AI, presumably physicians are concerned with the rise of ethical issues in patient care, worried about the additional burden of emerging technology, and dissatisfied with the limited respect for their work. The Physician’s Charter on Medical Professionalism, launched in 2002 for the new millennium, identified several threats to physician professionalism, including technology, market forces, healthcare system strain, and broader sociological shifts in the role of physicians in society (ABIM Foundation, 2002). When physicians anticipate the future regarding the potential effects of AI tools on their decision-making, they consider the information system as a whole (i.e. information infrastructure and its potential changes) as part of their work. It is not easy for them, or even for specialists, to assess how the implementation of new technologies into existing technological infrastructure will transform its dynamics and their work conditions; the mere lack of knowledge of the upcoming changes can increase their stress levels.

In a recent study, Dzeng & Wachter (2020) found evidence of insidious moral distress resulting from physicians' inability to act in accordance with their individual and professional ethical values due to institutional and societal constraints. One of the reasons for the causes of healthcare professionals' burnout is the rapid adoption of EMRs. These constraints have been exacerbated by changes in healthcare and society. This discontent amplifies a growing rift between the profession's ethical ideals and reality, and possibly also regarding an imaginary future with more complex technologies.

When it comes to AI technologies and their increasingly rational standards and automation that are being implemented in healthcare organizations, it is easy to conclude that new solutions fit perfectly into existing ideals of rationality and information technologies in hospitals. Belief in the superiority of AI and technological solutions produced using ADM systems, including many semi-automated chatbots, can amplify the project of rationality and automation in clinical practices and alter traditional decision-making practices based on epistemic probability and prudence. AI and complex algorithmic systems represent a growing resource of interactive, autonomous, and often self-learning (in the machine-learning sense) agency, potentially transforming cooperation between machines and professionals by emphasizing the agency of machines (Morley et al., 2019).

Since AI systems are involved in cognitive-discursive-oriented technological systems, embodied practices remain less prominent. Decision-making in medical practices is a partly embodied and partly cognitive process. It is an embodied process insofar as the body forms a sensorimotor loop with patients, colleagues, and objects with which the agent interacts in the unfolding situation at hand (Sandberg & Tsoukas, 2015). Expertise, in general, requires intersubjective circulation of knowledge, that is, a pool of dynamic knowledge as well as intersubjective criticism of the data, knowledge, and processes. The deployment of chatbots in healthcare, such as consultation, may impoverish the performance of work routines and diminish face-to-face interaction between clinicians and patients. Insofar as routine activities have been sufficiently bodily practiced, people have come across enough cases and, thus, their body schemas and shared organizational understandings are likely to have been well-developed. Insufficient consideration regarding the implementation of ADM in healthcare can lead to poor professional practices, creating long-term side effects and harm for professionals and their patients.

13.4 Care Robots as Imaginary Technologies in Nursing

When AI-based systems are believed to be able to automate the complex judgement of physicians, care robots will likely replace the repetitive and hard-labour tasks of nursing, either autonomously or semi-autonomously, while also growing emotional interactions with patients. Over twenty years ago, robotics guru Joseph Engelberger (1997) forecasted that a multitasking care robot for replacing nursing work tasks and assisting older people at home could soon be developed and manufactured (Engelberger, 2000). Despite the vast amounts of effort and money invested in the development of and research on care robotics over the last twenty years, no such robots have been created that could supersede nursing labour in assisting disabled or older people in their everyday activities. One of the main bottlenecks in developing useful care robots is the lack of sophisticated robotic limbs that could help people with, for example, dressing, bathing, and toileting (Van Aerschot & Parviainen, 2020). One barrier is related to the safety criteria established for health technology in which all kinds of moving or lifting robotic limbs are inspected from the perspective of the risk of injury to vulnerable patients. The problems in developing the robot’s kinematic capabilities to meet the safety standards of multitasking robots have led designers to simplify their goals. Social robots are designed to elicit human emotions and perform emotional reactions to bond with human users (Turkle, 2011), applying the principles of affective computing (Picard, 2015). Examples of such robots used in care sectors are the pet-like robot, Paro, and the humanoid robot, Pepper.

When a Pepper robot was placed in the lobby to guide customers in Kalasatama, a new health centre opened in Helsinki, Finland, in 2018, the director of Health and Substance Abuse Services of the City of Helsinki reminded visitors that the acquisition of a robot was related to Helsinki's strategy on improving the quality of public services for residents and visitors (Helsinki City, 2017). The director stressed that renewable services should be produced digitally with the support of AI and robotics (Nelskylä, 2018). The purpose of using a Pepper robot was to discover what kind of value the robot can bring to customer service in healthcare and social work. Pepper was programmed to guide customers to use check-in machines, direct customers to the correct waiting area, receive feedback, and hint at the location of the nearest restroom. The director defended its high price (€50,0000 plus €1,000 per month), though its benefits for customers remained obscure in the opening ceremony: 'In the future, as robots become more widespread, prices will certainly fall. You have to start somewhere if you want to be on the crest of digitalization and take it forward' (Nelskylä, 2018). The director's utterance exposes how protention and futurity have become a common state when it comes to robots or AI-driven technological investments in healthcare organizations. The domain of the 'not yet, but soon' has become the main way to justify the rationality and functionality of equipment that is constantly being developed as part of the operations of organizations. In other words, the devices do not need to be ready-made or their intended use entirely clear at the time of purchase, but with sufficient experimentation and development, the devices will take on their final shape and become embedded in the organizational environment (Parviainen & Coeckelbergh, 2021). This is convenient for the technology industry, as it can produce 'semi-finished' devices in the sense that embodied practices around these devices are developed by professionals and customers through a so-called 'culture of experimentation' (Lindgren & Münch, 2016). However, such an experiment can become very costly if it erodes existing (good) work practices but does not build new ones, especially if robots are ultimately not profitable to deploy.

Social robots like Pepper can hardly provide significant help in automating or supporting the physical work of nursing. Instead, they seek a place and way of operating within customer interfaces of health organizations. Still, for instance, the *Guardian* reported in 2016 that ‘a robot could be grandma’s new carer’, using the Pepper robot as the illustrative photo. This type of robot does not have a motor ability that is fine enough to assist elderly people in their daily activities. Using the Pepper robot to illustrate helping the old creates a false impression of the care robot’s abilities. Another example of providing fallacious views on the capabilities of today’s care robots is to illustrate news stories using images of robot prototypes, as was the case in another *Guardian* story published in 2018. They stated, ‘Japan lays groundwork for boom in robot carers’, and used—perhaps accidentally—the photo of a suspended robot project, a Japanese prototype known as ‘Robear’, which was depicted lifting a woman for a demonstration at RIKEN-TRI in Nagoya. The robot prototype was developed to transfer frail patients from a wheelchair to a bed. However, the newspaper did not state that RIKEN-TRI and its Center for Human-Interactive Robot Research (RTC) finished its scheduled research term and was dissolved at the end of March 2015.[2] Thus, the development of the robot had already been suspended three years before the *Guardian* story was published, and it was clear when the photo was run that the lifting robot would never be launched on the market.

The challenges caused by the small number of care robots are clearly visible in experiments and the research design of care robots for the elderly. It is likely that research teams will acquire robots for experiments if affordable and functional equipment become available. Instead of physical robots, they use ‘imaginary robots’ in inquiring about nurses’ and patients’ attitudes towards robotics, known as robot-acceptance surveys. Most researchers utilize pictures of robots, narratives, audio-video material of robots, and robot prototypes to elicit respondents’ opinions of care robots

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[2] For more information, see <http://rtc.nagoya.riken.jp/index-e.html>.

(e.g. Pino et al., 2015; Hall et al., 2017; Khosla et al., 2017; Pew Research Center, 2017; Coco et al., 2018; D'Onofrio et al., 2018). For instance, a survey conducted by the Pew Research Center (2017) shows how the narratives used in the questionnaire lean on Engelberger's futuristic vision without providing concrete examples of care-robot solutions. In this case, respondents were asked to read and reply to the following scenario:

> Today, many older adults move into assisted living facilities when they can no longer live independently. In the future, people could be provided with a robot caregiver that would allow them to continue living in their own home as they age. This robot would be available 24 hours a day to help with household chores, test vital signs and dispense medication, or call for assistance in an emergency. It would also have conversational skills and could serve as a companion for people who live alone.

This narrative of imaginary care robots shows that there is a vast gulf between the visions of future robotics and the existing complex and hectic environment in which nurses do their work. The complexity of social, emotional, and physical human needs and processes seem to be somewhat distant or difficult to capture in the design of robots. The neediness, frailty, and vulnerability that come with decreasing physical and cognitive capacity are not easy, or perhaps not at all possible, to meet with care robots. Professionals who have learned from experience how to respond to patients in vulnerable conditions have developed embodied and affective capacity and tacit knowledge to estimate how to use their bodily skills in collaboration with patients. When they need to learn bodily practices while using equipment, bodily inscribed tacit knowledge sometimes makes it harder to switch off or unlearn these skills compared to cognitive skills (Hindmarsh & Pilnick, 2007; Wright, 2019). In addition, nurses suffer from ethics stress when they have been challenged by value-laden decisions related to technology, such as, the limits of interventions, patient autonomy, and quality-of-life issues (Raines, 2000). Ulrich et al. (2007) found that nurses encounter difficult ethical issues in patient care and feel frustrated or angry when they cannot resolve an ethical issue due to the bureaucratic system in healthcare organizations. It is likely that the potential entry of new devices, such as care robots, will not reduce but rather increase ethics stress.

13.5 Conclusion

This chapter has used a phenomenologically informed approach to show that the implementation of new technologies in an organization is a complex process in which—particularly during crises—new technologies are introduced into professional work. Based on phenomenological insights, the constitutive roles of situated embodiment and interrelational connections for performance have been outlined. Such extended understanding offers new perspectives on bodily as well as pre-conscious expectations that are relevant to imaginary technologies. When professionals are engaged in performing their work, their bodies are always actively involved, no matter how demanding the cognitive effort is. Healthcare professionals conduct their work tasks from within the framework of ‘practical rationality’; they seek to grasp how sense-making is accomplished by situating it within the ‘unfolding relational whole’ of the primary purpose of the organization (Sandberg & Tsoukas, 2011: 352). The phenomenological view of embodied information infrastructure allows us to consider the complex technologies that are intertwined with clinical practices in healthcare professionals’ work. Such an approach can help to clarify questions such: how justified is the rhetoric of the cost-effectiveness and high-quality requirements associated with AI technologies if existing healthcare technology systems are burdening staff? Paradoxically, potential consequences of emerging technologies cannot be reliably confirmed by research or risk analysis, thus, they remain in the category of the unknowable.

We have argued that protentional anticipation dominates the functions of public healthcare organizations, but not all people necessarily recognize how managerial acts are primarily intended to control the future. Using the concept of imaginary technologies, we suggested, first, that existing technological infrastructure shapes professionals' work; and, second, that the strategies of future technologies reconfigure our conceptions of the consequences that the use of emerging technology in health organizations may have in the future. Professionals do their work under the pressure of different visions and expectations for the future, feeling ethics stress regarding these potential changes. To offer a more coherent and integrative conceptualization of what defines this implication process and how it is connected with professional work, we used two examples: ADM systems and care robotics. Their potential impact on reconfiguring the information infrastructure helps us to more effectively recognize and understand the multiple, emergent, and shifting socio-material assemblages entailed in contemporary organizing.

National governments, the EU, and other international actors are important players in building the socio-technical imagination of robotics and AI, but they need other actors to steer funding in the desired way and to shape citizens' perceptions in favour of their visions. The media has an important role to play in this task, as it presents to the public the astonishing possibilities of the technology of the future. The 'hype' and 'hope' built around new technologies, with their potential and their horrific images, have a significant performative dimension in shaping citizens' perceptions. We argued that, in the media, the presentation of care robots as the saviour of care for the elderly is common even though no devices are available that would bring significant benefits to care. When the media frequently report on individual care-robot experiments or uncertain prototypes under development, the purely speculative possibility that robots may eventually be of some use in the care of the elderly begins to be understood by the public as fact. The presentations of imaginary technologies based on prototypes and real technologies in use are easily confused in people's minds.

Socio-technical imagination has proven particularly useful for decision-makers who believe that technologies solve societal problems. Where appropriate, it serves both as a policy objective and as a tool to build its legitimacy. It is difficult to oppose this prediction because, based on socio-technical imagination, one cannot prove it to be false. Visions of alternative futures in human care without the support of emerging technologies are rarely provided in white papers or roadmaps. Given the political attractiveness of socio-technical imagination and the risks and instabilities that inevitably accompany it, an understanding of socio-technical imagination is an essential part of R&D initiatives in robotics and AI. The discussion of imaginary technologies in the context of healthcare organizations thereby sharpens the focus and extends the scope of the emerging-technologies perspective, helping us to clarify conceptual ambiguities and to better locate the visions of roadmaps and white papers on public healthcare and our expectations for it. It is hoped that the phenomenological approach proposed in this chapter will contribute to a more comprehensive understanding and critically oriented research on robotics and AI in healthcare organizations.

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