Translational Systems Sciences 19

Marja Toivonen
Eveliina Saari *Editors*

Human-Centered Digitalization and Services

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Translational Systems Sciences

Volume 19

In 1956, Kenneth Boulding explained the concept of General Systems Theory as a skeleton of science. He describes that it hopes to develop something like a "spectrum" of theories—a system of systems which may perform the function of a "gestalt" in theoretical construction. Such "gestalts" in special fields have been of great value in directing research towards the gaps which they reveal.

There were, at that time, other important conceptual frameworks and theories, such as cybernetics. Additional theories and applications developed later, including synergetics, cognitive science, complex adaptive systems, and many others. Some focused on principles within specific domains of knowledge and others crossed areas of knowledge and practice, along the spectrum described by Boulding.

Also in 1956, the Society for General Systems Research (now the International Society for the Systems Sciences) was founded. One of the concerns of the founders, even then, was the state of the human condition, and what science could do about it.

The present Translational Systems Sciences book series aims at cultivating a new frontier of systems sciences for contributing to the need for practical applications that benefit people.

The concept of translational research originally comes from medical science for enhancing human health and well-being. Translational medical research is often labeled as "Bench to Bedside." It places emphasis on translating the findings in basic research (at bench) more quickly and efficiently into medical practice (at bedside). At the same time, needs and demands from practice drive the development of new and innovative ideas and concepts. In this tightly coupled process it is essential to remove barriers to multi-disciplinary collaboration.

The present series attempts to bridge and integrate basic research founded in systems concepts, logic, theories and models with systems practices and methodologies, into a process of systems research. Since both bench and bedside involve diverse stakeholder groups, including researchers, practitioners and users, translational systems science works to create common platforms for language to activate the "bench to bedside" cycle.

In order to create a resilient and sustainable society in the twenty-first century, we unquestionably need open social innovation through which we create new social values, and realize them in society by connecting diverse ideas and developing new solutions. We assume three types of social values, namely: (1) values relevant to social infrastructure such as safety, security, and amenity; (2) values created by innovation in business, economics, and management practices; and, (3) values necessary for community sustainability brought about by conflict resolution and consensus building.

The series will first approach these social values from a systems science perspective by drawing on a range of disciplines in trans-disciplinary and cross-cultural ways. They may include social systems theory, sociology, business administration, management information science, organization science, computational mathematical organization theory, economics, evolutionary economics, international political science, jurisprudence, policy science, socioinformation studies, cognitive science, artificial intelligence, complex adaptive systems theory, philosophy of science, and other related disciplines. In addition, this series will promote translational systems science as a means of scientific research that facilitates the translation of findings from basic science to practical applications, and vice versa.

We believe that this book series should advance a new frontier in systems sciences by presenting theoretical and conceptual frameworks, as well as theories for design and application, for twenty-first-century socioeconomic systems in a translational and transdisciplinary context.

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Marja Toivonen • Eveliina Saari
Editors

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Springer

Editors
Marja Toivonen
University of Helsinki
Helsinki, Finland

Eveliina Saari
Finnish Institute of Occupational Health
Helsinki, Finland

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Preface

Background to the Topics of the Book

The digitalization of services has been marketed to us in terms of time saving, new means of participation, and the cost efficiency of service systems. What has not been discussed so much is how the digitalization of service ecosystems is intertwined with the institutional logics of providing services to citizens. No political decision-making opportunity has been offered to citizens for us to decide whether or not we want digital services. Nevertheless, digital interfaces revolutionize the relationship between the service worker and the user, and ubiquitous ICT has a significant impact on our everyday lives.

This book provides a topical overview of the impacts of digitalization from the viewpoints of services, work, and everyday human life. Its basic argument is that a prominent issue in digitalization is the development of new types of services which are enabled by digitalization but often buried under the emphasis on technology and various devices. The users of digital services, whether they are acting for fun or tending to their social responsibilities, are suddenly doing the cognitive work previously conducted by service workers. This phenomenon, called heteromation, as opposed to automation, involves hidden human labor often unrecognized by the participants themselves, whose social media activity or clicks in service platforms may be transformed into valuable data or bring value to the service provider, as these self-service systems save service providers resources by eliminating paid workers.

The book summarizes the 20-year history of research on the relationship between ICT and service innovation, highlighting the fact that ongoing digitalization is a qualitatively different phenomenon and means a paradigmatic change. For example, the digitalization of the financial sector introduced citizens to the service innovation of the internet bank, which gradually but radically diminished face-to-face service and the number of bank offices and clerks. Currently topical is how digitalization is implemented in services that are not based on simple technical transactions, but that gain their significant value from emphatic encounters between human beings, such

as education and social and health care. Furthermore, several countries—like Finland—are currently obliging public services to provide citizens with digital services, which may lead to diminishing face-to-face contact points with civil servants. Since there might be one million citizens in Finland who cannot or do not want to use mobile phones or ICT devices, the Ministry of Finance began national-level actions in 2018 to provide citizens with sufficient digital support. Digital support for learning is offered by libraries, service providers, associations, and adult education centers; the best regional model for organizing this in a sustainable way is currently being tried out.

It seems that the power of technology in everyday life and in society is currently accelerating, since, after the conventional computation of service processes, Big Data and artificial intelligence are now expected to be adopted as the main tools for service systems. There is a tendency to think that technology development is inevitable, with a logic beyond human control, and it is often referred to as "technological determinism". However, critics of technological determinism have argued that there is always a human element in the development and adoption of technology, which makes the future more complex and unanticipated. The all-encompassing integration and transmission of data raises critical human issues, such as maintaining human dignity and individual autonomy. Digitalization also creates new needs for interaction practices with broad participation, trust, and willingness to share knowledge at their core. This book highlights how we need to increase co-creation and citizen empowerment to make digitalization support the development of well-being and sustainability.

The empirical analyses of the book focus on the changing logic of services and service work. The book explains how employees and professionals can and should be involved in designing their future work and digital service innovations, as well as in evaluating them. As the face-to-face servant role may partly fade away when the technological interface pushes workers into back offices, these workers may obtain opportunities to create new roles. As Bowen anticipates, they may become innovators of new services on the basis of their deep experience with clients; enablers, helping and training clients to use technology; differentiators, providing a genuinely empathetic and personal face to the surface of the service; or coordinators, handling integration and building bridges between different offerings. However, in order for this to take place, management needs to see its employees as significant actors who do not only adapt to ICT systems, but also have the opportunity to modify and influence them. Proactiveness, empowerment, and participation in innovation endeavors are significant ways with which users and service professionals can guarantee meaningful work in the socio-technological transition. Supporting employee-driven innovation and implementing a developmental evaluation culture at workplaces are means of ensuring work-related well-being and facilitate sustainable human-centered digitalization.

The book was initiated in our project called "The revolution of service economy – Human being at the core of digitalization," which was funded by Business Finland and the participating organizations in 2015–2018. The project opened up a view of the digital service innovations of the Finnish public sector and third sector

in the contexts of early childhood education, social and health care, housing for the elderly and the everyday life of young people. This book reports the research results of these innovations. We would like to thank our colleagues Mervi Hasu, Helinä Melkas, Pirjo Korvela, Kirsi Hyytinen, Johanna Leväsluoto, Satu Pekkarinen, Sari Käpykangas, Mirva Hyypiä, and Anne Nordlund for their contributions. To gain a broader and deeper perspective, we invited our international and domestic collaborators to contribute to the understanding of human-centeredness in digitalization. We warmly acknowledge the contributions of Ian Miles, Lars Fuglsang, Kyoichi Kijima, Mattias Elg, Sanna Sekki, Jussi Silvonen, Maria Røhnebæk, Marit Engen, Trude Hella Eide, Liudmila Bagdoniene, Aurelija Blazeviciene, Gintare Valkauskiene, Oliver Alexander Tafdrup, Bjarke Lindsø Andersen, Cathrine Hasse, Kentaro Watanabe, Marketta Niemelä, Tom Hope, Nina Janasik, Joanna J. Bryson, and Andreas Theodorou. All these contributions form a rich whole, with inspiring ideas and novel insights. Finally, we wish to thank Professor Kyoichi Kijima who provided us with the opportunity to include our book as a volume in the Series of Translational Systems Sciences.

We recommend this book to readers who seek an overview of the current understanding of the human side of digitalization and are looking for concrete cases that illustrate this topic in several countries. Although the chapters are scientific texts through which we participate in the scientific discussion on the digitalization of work and everyday life, we hope that this book finds its way to the hands of not only researchers, but also service practitioners, professionals, managers, and technology developers.

Helsinki, Finland

Marja Toivonen
Eveliina Saari

Structure of the Book

The book is divided into four parts, and each part includes four chapters. The first part "Theoretical Perspectives on Digitalization and Service Innovation" provides an overview of the innovative potential of digitalization in the service context and presents three topical approaches for the analysis of human-centric service innovation: a practice-based view, a systems view, and the integrative approach of multi-criteria and developmental evaluation of innovations.

The book is opened by an important pioneer of service innovation research: Ian Miles. In Chap. 1, he describes the development of the service economy from the 1950s to the present, using his own life history as an illustrative example. He starts from the description of the transfer from small-scale businesses to mass markets and standardized services ("Service economy 1.0"). The next development stage ("Service economy 2.0") witnesses the adoption of many technological appliances, especially in the back offices of organizations. The uptake of the Internet and the development of online services and platforms characterize the current stage "Service economy 3.0." During this stage, the social implications of technology have become prominent: consumer co-production as the positive side of the development and polarization and inequality its negative side. Finally, the author identifies many signs of "Service Economy 4.0," which will not only effectively utilize large-scale data analytics and artificial intelligence, but will also require human-centered design and social innovations in order to benefit users and solve global challenges.

In Chap. 2, Lars Fuglsang discusses human-centric service innovations in public services. A problem in these innovations—typically carried out via focus groups, living labs and democratic approaches—is their experimental nature, which makes them short-lived and nonspread. As an alternative, the author explores a practice-based approach that recognizes the messy reality of everyday life and aims to understand the real practices of co-innovation. A central argument is that innovation is not a readymade entity from the beginning, or a specific procedure, it can emerge more invisibly from interactive processes. The chapter defines three contexts of human-centric innovation (individual, group, and collective) and three innovative practices (bricolage, the system approach, and the systemic approach). Based on these, a typology of nine practices of human-centric innovation is tentatively laid out and

explored via a case study. The chapter shows how human-centric service innovation is integrated with co-production in public services, defines how a practice-based model treats knowledge and learning, and discusses the advantage of the practice-based model from a managerial, employee, and a societal perspective.

Chapter 3, authored by Kyoichi Kijima and Marja Toivonen, applies a systems perspective. It starts with the argument that a technological focus is not enough for the successful development and application of digitalization; the crucial issue is how to link technological and human resources together. Systems thinking is essential for understanding the interdependencies resulting from these linkages at different levels: in activity systems at the micro level, in networks and ecosystems at the meso level, and in the institutional set-up that supports and regulates the development at the macro level. After the presentation of the basic principles and benefits of systems thinking, Chapter 3 analyzes these interdependencies in more detail. A central message throughout is that the value of a specific resource depends on its relation to other resources. The highly dynamic nature of the development of digitalization is also emphasized: at the end, the chapter examines how the systems' perspective can be applied in conditions of change.

Chapter 4, authored by Kirsi Hyytinen, Eveliina Saari, and Mattias Elg, develops a human-centered co-evaluation method for the evaluation of service innovations in the context of digital services. Its starting point is the need to strengthen the role of users and employees in innovation and the growing importance of the social and sustainable aspects of innovation. The method integrates a multi-criteria evaluation framework with a process of developmental evaluation. In this way, it takes into account the various impacts of innovations on the one hand and supports multi-voiced evaluation and continuous learning on the other. The method emphasizes human and societal impacts, which are analyzed in parallel with the traditional techno-economic characteristics of innovations. It makes human-centeredness and sustainability more visible as values than traditional evaluations and thus guides development toward more inclusive and ethical digitalization.

The second part of the book "Approaches and Case Studies on Human Interaction in the Service Context" opens up interaction issues linked to the digital context. The part starts with a study of the changes that digitalization has caused in the everyday lives of families and young people. The second chapter shows that the impact of digitalization may be limited in some service areas: the chapter discusses services for refugees and immigrants. In the third chapter, digitalization is again one aspect of the development; here the focus is on the co-creation between professionals and patients in health care. The part ends with a chapter that analyzes technological breakdowns, showing that they are not only nuisances but may be used as sources of learning.

The changing structure of everyday life is the research topic of Chap. 5, authored by Anne Nordlund, Sanna Sekki, Pirjo Korvela, and Jussi Silvonen. This chapter examines the impacts of digitalization on the mastery of everyday lives of families and young people. The data were gathered during three projects using field notes and in-depth interviews. The analyses reveal the multidimensional nature of digitalized daily life: passiveness on the one hand, and the permeability of digitalization

in daily chores on the other. The results indicate that both families and young people have problems with the mastering of everyday life. A sequence map proved to be a promising tool for supporting adaptation to constant changes and new rhythms. The map enabled the identification of daily problems and the reorganization of the structure of everyday life. A central conclusion based on the study is that digitalization is not a separate part of daily life; it is intertwined in daily actions.

In Chap. 6, Maria Røhnebæk, Marit Engen, and Trude Hella Eide explore the applicability of a service ecosystem perspective in human-centered service contexts. The chapter is based on data from the Norwegian "Introduction program," which is a public service offered to newly arrived refugees and immigrants granted asylum. Thus, the chapter deals with services for users in vulnerable and marginalized positions. In this context, the solutions to problems and areas for improvement cannot be found in the digitalization of service processes. The theoretical background is in service-dominant logic (S-D logic), which focuses on value creation processes and is relevant for capturing their complexity. This chapter addresses this complexity by integrating the service ecosystem perspective with institutional logics theory. Based on this integrated view, the authors explore how different institutional logics influence resource integration in service ecosystems and how this in turn affects the service's ability to facilitate the social inclusion of refugee immigrants.

Chapter 7 is based on an empirical study of public healthcare organizations in Lithuania and is authored by Liudmila Bagdoniene, Aurelija Blazeviciene, and Gintare Valkauskiene. The study examines how healthcare professionals conceive patients' value co-creation activities and what kinds of organizational factors they perceive as supporting or hindering value co-creation. The study was carried out via face-to-face interviews of doctors and focus groups of nurses. The results indicate that doctors and nurses recognize patients' value creating activities in both the service encounter and the patients' own contexts. They also emphasize the significance of social interaction and communication. However, the professionals have difficulties in taking the patients' perspective in the actual care. They highlight the patients' compliance with care plans and orders, which reflects traditional professionalism and power asymmetry.

Chapter 8, authored by Oliver Alexander Tafdrup, Bjarke Lindsø Andersen, and Cathrine Hasse, analyzes how technological breakdowns—cases in which the technologies suddenly cease to function properly—may promote learning and technological literacy. The chapter is based on two cases from educational contexts (a Danish primary school and Australian higher education) and its theoretical background lies in postphenomenology and the concept of situated learning. A central argument is that a technological breakdown is dependent on the perceiving subject: it is a breakdown for someone. Two variations of attitudes—the potent and the impotent—can be found as a reaction to breakdowns. The former means that the breakdown is perceived as an alternative condition that can be dealt with. The latter means that the breakdown of the technology is seen as also implying a breakdown of the core activity. The impotent attitude focuses on how the broken technology will interfere with future activities, while the potent attitude tries to understand what

caused the breakdown and to learn from this. Learning how to cope with breakdowns fosters technological literacy.

The third part of the book "Analyses of the New Opportunities Provided by Digital Solutions" examines examples of the application of digital tools, equipment, and service platforms. The first two chapters focus on ICT-based solutions and robotics in elderly care. They include an international comparison and a study of end-users' opinions of robots—both in general and in concrete cases. The third chapter describes an experiment in which a digital platform was introduced as a tool of service co-production in child and family services. Finally, the fourth chapter explores how the digital information systems in hospitals support the "caring mind" of nurses.

In Chap. 9, Kentaro Watanabe and Marketta Niemelä present the findings of a comparative study of Japanese and Finnish elderly care service systems. The starting point of the study is the growing concern regarding aging and the increasing need for care services. In the pursuit of independence and sustainable care for the elderly, ICT-based solutions and robotics are expected to be essential. As the aging issue is global, and its solutions may be global, international comparisons are important. The study applied a mixed-method approach and included three types of stakeholders as target groups: the elderly, care personnel, and managers of care services. The results show that basic care practices, management concerns, and stakeholder relationships have common features in Japan and Finland. However, differences exist in lifestyles, care work cultures, and social welfare policies, as well as in the acceptance of individual technologies. Thus, the study highlights the careful surveying of local conditions in the development of elderly care service systems. These systems should also be observed as a dynamic entity that evolves through interactions with stakeholders.

Marketta Niemelä and Helinä Melkas continue the examination on the topic of elderly care in Chap. 10. Their study focuses on care robots, targeted for use in care and nursing environments, or for supporting independent living for the elderly and those with disabilities. The chapter provides an introductory review of care robots and discusses their acceptability in elderly care. The focus is on the end users of the robots, the elderly, and care professionals, who are often neglected within the field of technology development. The end-user perspective is approached through three empirical studies: a citizen panel for older adults on their expectations and concerns for care robots, a case study of a social robot adopted in three care facilities for older people, and a case study of a mobile telepresence robot piloted in two care facilities. In these studies, both the older people and the professionals had positive perceptions of care robots. They also presented the requirements and framework conditions that should be considered when using robots in care. In particular, the study participants highlighted the priority of humans in care work, although they accepted robots for carrying out secondary care tasks.

Chapter 11, authored by Johanna Leväsluoto, Kirsi Hyytinen, and Marja Toivonen, discusses experimental development as a model of innovation and analyzes its application in a public sector case in a middle-sized Finnish city. Experimentation has been suggested to answer the problems of slowness and

ineffectiveness in current innovation activities. In this study, the experiment focused on a new integrated model of well-being that aimed to promote multi-professional collaboration and citizen empowerment in child and family services. A common service plan and a digital platform were core elements of the model. However, the interviews of the stakeholders revealed that the purpose of the experiment remained too vague to the practitioners, and the experiment was terminated before the deadline. Other central challenges were also top-down management, a growing workload, and problems with the digital platform. Despite the "failure," the experiment offered valuable lessons; future efforts should pay particular attention to conceptual clarity and to integration between local activities and governmental policies.

Chapter 12, authored by Tom Hope, explores digitalized health care from the perspective of nursing in large hospitals. Digital technologies in health care are categorized into medical and health records, mobile health technologies, and telemedicine and online support. The chapter includes a case study, which depicts the challenges of digitalization in the context of care practices: the emotional needs of those receiving and providing care are central but may be neglected when medical information is transferred from paper records to electronic records. The practice of "box-ticking" results in deficits in care information that involves emotional contents, which means that the current electronic medical records do not allow nurses to sufficiently express their "caring mind." These information deficits may become especially problematic when online applications and telemedicine enable the spread of information outside the hospital to other care facilities or to carers at home.

The fourth part "Understanding the Interaction Between Digital and Human Resources" highlights the main title of the book: the issue of human-centeredness in digitalization. This part opens with an analysis of human-centric data activism, including the suggestion of a more social and relational approach. The next chapter explores the promise of digitalization from the viewpoint of social sustainability, focusing on the development of elderly care systems. The third chapter brings to the fore the development of human agency in technological transition and highlights the challenges in organizing a balance between human and technological resources. The last chapter of the whole book examines the topic of human-centric artificial intelligence. The authors review the necessity of maintaining human control, and the mechanisms by which such control can be achieved.

The part is opened by Nina Janasik in Chap. 13. She analyzes the issue of human dignity in the digital era. The starting point is the argument that in order to become an efficient alternative in the current data economy, individualistic, and human-centric data activism needs to become more intertwined with social science perspectives. This development is already materializing in data-driven initiatives that apply an "OurData" approach rather than the "MyData" approach. The emphasis is not on the individual's right to privacy and mastery of personal data, but on the notion that a great deal of personal data is fundamentally social. The author argues that the contrast between "MyData" and "OurData" reflects different ways of conceptualizing the basis of human dignity. The "anthropocentric" (individualistic) view needs to be complemented with the "relational" (collective) view to form a

synthetic "anthropo-eccentric" view capable of addressing the complex challenges of data activism.

Chapter 14 focuses on the sustainability of the elderly care system. The chapter is authored by Satu Pekkarinen, Helinä Melkas, and Mirva Hyypiä. They see digitalization and the implementation of technologies in elderly care as offering possible solutions to the social and economic challenges of sustainability. Elderly care technologies are studied through the framework of sociotechnical transitions. The study focuses on how promising niches are developed and the conditions in which they contribute to regime change. The authors identify the factors that either facilitate or hinder sustainable development and the implementation and diffusion of technologies in elderly care. The chapter covers three case studies: the introduction of tablet computers in senior housing, the construction of a multi-sensory room in a care home, and the use of a care robot in care homes and in a rehabilitation hospital. The results indicate that the critical factors for sustainable niche development are the involvement of users in the development processes and the simultaneous development of technologies and services. The critical factors in niche–regime interaction are attitudes and the maturity of technologies. The need to consider a wider perspective, rather than a singular disruption, is a key issue.

In Chap. 15, Eveliina Saari, Sari Käpykangas, and Mervi Hasu analyze how backstage service employees may rise from invisibility to active agency when they are at risk of losing their jobs during the digitalization of services. This analysis is based on an intervention study that included interviews of employees about their future work horizons, interviews of management and human resources development, and workshops to support the co-creation of future service and work. The approach derives from the literature on human agency. The interviews of the managers and human resources development indicated how difficult it is to foresee and develop the future competencies of employees before deciding upon the path to take to organize a service that utilizes both human and technological resources. The study also makes visible the backstage employees' perspectives and their attempts to exercise agency during technological transition; something previous studies have rarely analyzed in depth.

The book ends with Chap. 16, in which Joanna J. Bryson and Andreas Theodorou focus on the topic of artificial intelligence. The authors highlight that maintaining human-centric artificial intelligence is necessary for society to have long-term stability. According to them, the legal and technological problems of maintaining control are actually fairly well understood and amenable to engineering. The real problem is establishing the social and political will for assigning and maintaining accountability for artifacts when they are generated or used. In this chapter, the authors review the necessity and tractability of maintaining human control, and the mechanisms by which such control can be achieved. They argue that this problem is both the most interesting and the most threatening, because achieving consensus on any human-centered approach requires at least some measure of agreement on broad existential concerns.

Contents

Part I
Theoretical Perspectives on Digitalization and Service Innovation

Chapter 1
Transformations of Services

Ian Miles

Abstract The service economy has been subject to a huge number of changes over the course of the last century. These can be grouped into a series of stages, from Service Economy 1.0 to Service Economy 3.0, with digitalisation increasingly prominent in the later steps of this process. Major elements in this evolution are discussed here through the lenses of personal experience (both from everyday life and from research), and questions raised about how far they can be described as human-centred. Finally, the contours of an emerging Service Economy 4.0 are examined, and it is argued that to be human-centred services will be need to give much more centrality of environmental challenges.

1.1 Introduction

The term "human-centred" is widely used in the context of design of digital (and other) systems, implying that the design process has sought to give priority to the requirements and capabilities of human beings using these systems. Rather than focus on what is technically elegant or impressive or simply cheap and economically efficient, the aim is to create things that are usable, functional, ergonomic, safe and other features that value the users of these goods, services or systems. Who are the humans that we are dealing with? "Users" suggest that we are putting to one side the interests of corporate managers and shareholders, government bureaucrats and surveillance agents. But the human "users" of service systems may refer to service workers and managers as well as service customers, clients, and other end users (who may not necessarily be those purchasing the service); and as targets of service (such as criminals and others who may be involuntary users of services provided by courts and prisons); and why not also include people experiencing collateral benefit

I. Miles (✉)
Alliance Manchester Business School, University of Manchester, Manchester, UK

National Research University – Higher School of Economics, Moscow, Russia
e-mail: imiles@hse.ru

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or damage from service systems? For example, this latter category includes families of recipients of health services – and of people that have become addicted to gambling services; those whose environment is affected by transport or entertainment-related noise; those exposed to the fumes from restaurants and the insidious messages of advertising agencies; and so on.

Economic systems have evolved, in the West, from feudal models where organisations were largely shaped to maintain a flow of tributes to a hereditary nobility to capitalist models, empowering many new social actors to contend in the production and appropriation of wealth and well-being. Capitalism is notoriously "restless" (in Stan Metcalfe's formulation),[1] and both its new political constellations and its industrial and technological revolutions have given rise to a succession of social formations. Depending on the focus of analysis, commentators talk of pluralist democracies, consumer societies, welfare states, information societies and so on; specific constructs like post-Fordism, neoliberalism or post-modernism are deployed to capture moments in the successive transformation of our societies. Some personal recollections can help identify the transformations that have been underway in the course of one lifetime in the "service economy" – another of these labels. They will depict how services that undertake different sorts of transformation (e.g. those transforming physical artefacts, those transforming data and symbols, those transforming people) have undergone their own distinctive transformations.

1.2 Looking Back

In the 1950s, when I was a child, my parents worked in service industries – as they did for most of their lives. We lived in a medium-sized English market town (population in the tens of thousands). My earliest memories are of the pub that they ran, in a side street near the town centre. There were at least three bars (one for games and noisy activities, one for more private conversations and one where the first television set in our neighbourhood was installed in time for a large crowd to watch the coronation of Queen Elizabeth II). My parents, together with my father's aunt, worked long hours, manually serving drinks from taps attached to large barrels (these fascinated me as an infant). Payment was by coins and notes, manually counted and (I believe) bills and exchanges calculated by mental arithmetic. This sort of service had barely changed over a century, though the barrels were now delivered by motor transport instead of horse-drawn carts; the range of drinks and snacks (crisps, nuts, etc.) changed very slowly. Physical labour and cognitive skills were required, along with the social skills needed to maintain the friendly atmosphere of the pub. For customers, the service would have been human-centred in terms of providing a space for socialisation, relaxation, even entertainment (games such as darts, occasional television). However, opening hours were very restricted (regulations had been in place since the First World War has occasioned fears of

[1] Metcalfe (2008).

poor public health and distraction from the war effort). Though this meant that my parents were not on call 24 h, they were expected to work lunchtimes and evenings practically every day of the year. Holidays were impossible. This pattern of work was hardly human-centred in terms of the demands on the service suppliers.

No wonder that my parents were happy to move on from the hard labour of this inherited family business into demanding, but less onerous, service work. My father continued bar work for several years, but now for a large institutional establishment (servicing naval service personnel, on an air base, in fact). Later he took up a job as operator in a telephone exchange (the UK telephone service was run in those days as part of the Post Office); the task involved manually establishing the connection between pairs of telephone numbers. Both jobs involved plenty of night work. My mother, meanwhile, was running a small shop, mainly selling sweets, cigarettes and a limited range of packaged and tinned groceries. The cash register was a mechanical till which performed basic arithmetic but retained no records. A refrigerator was used to store ice creams – frozen foods and domestic freezers were novelties that had yet to really take off. Most custom was face-to-face, but there were a few routine deliveries to elderly people with simple needs and mobility problems. I dropped off these items on my way to school, always apprehensive that the old ladies might have some major health issue when I called on them! The entire ground floor of the pub was devoted to the business; the shop just occupied the part of the house where a front room would be.

While there were many small and local shops, and supermarkets were a new phenomenon restricted to the larger cities, my town did feature some large stores. The most prominent was Woolworths, featuring long counters, from one side of which staff served customers, who were on the other side, the products they required. I only learned decades later that Woolworths was part of an American retail multinational firm. Entertainment was the only arena in which I was aware of international service firms operating; the local cinema (part of a UK chain) often showed American films. I would also listen to international radio stations, which often presented material (rock and roll music!) more to my taste than the BBC's monopoly services. (My parents avoided TV for many years after leaving the pub, so I missed the emergence of commercial TV broadcasters in the UK.) The town did feature a branch of a British chain of "tea shops" – a birthday treat would be to be taken to, or given money to get, special ice cream and jelly desserts there – but fast-food multinationals were decades away; fish-and-chip shops were a decidedly local business.

As I grew older, changes in mobility and transport systems were having their effect. When I was young, it was safe to play in the streets: private cars were fairly rare, and buses ran on main roads only. When I was a little older, and my family had moved from the pub, the streets were already becoming busier. Down the road a friend's father ran a one-man taxi service – no radio cab, trips were organised via phone calls. Both homes were on streets where there was a railway at the end of the road: when I was small, my friends and I would play games of running through the steam from a coal-powered train; steam was displaced by diesel when I was a little older. The local railway station was closed in the 1960s, along with many other sta-

tions deemed uneconomic, during a major round of "rationalisation" of public transport services. I had been familiar with the platforms of railway stations; travelling into the country or to the seaside involved train journeys.

Next door to the pub had been a cinema (I can remember hearing the theme music of films while lying in bed at night); across the road was a traditional fish-and-chips shop (I can remember the fire service being called out to put out a blaze there). Google Street View shows me that the cinema has been turned into a club (music, dance, drinks); the pub is a bar with extensive opening hours; the fish-and-chip shop is also a bar (though further web searching suggests it has closed). The sweet shop has been converted into a purely noncommercial building (along with many of the small shops – a bakery, a TV and electronics business, a newsagent – in its immediate neighbourhood). There is no sign of the taxi business, though several small taxi-independent firms exist in the town. Incidentally, when the pub closed in the mid-1960s, the first occupiers were a taxi firm and a Chinese takeaway food outlet. The leather good factories at the end of the road and elsewhere in the town have long gone – the remaining large manufacturing business is in aerospace, and that has been subject to recurrent closure fears at least since the 1970s.

1.3 Service Economy 1.0

My family was responsible for small-scale service businesses, providing access to the products of food and beverage manufactures (and linked in to other services such as banks), with connections via goods transport and via post and telephone communications. They operated within fixed opening hours and served mainly local customers and a few others passing by on their way to nearby rail and bus services. Much of the business followed procedures that had been established for a century or more.

The mass markets that exploded in the nineteenth century, associated with industrialisation, machine-based transport, telecommunications and rapid urbanisation, had displaced local services of even longer provenance, so industrial society already had engendered one transformation of what became known as service industries. But further transformations were to come much more rapidly. By the middle of the twentieth century, a little under half of the UK workforce worked in service industries (it was not yet a "service economy" by this criterion); by the end of the century, it was just under three-quarters and continuing to rise. (The share of the service workforce accounted for by women rose from around 60% to over 85% – cf. OECD *Labour Force Statistics*, 1997.) Many new service occupations were created, especially in public services and in business services. Large – often international – organisations in retail, in hospitality and catering and in many other services displaced much of the small-scale, local business in more traditional services. Thus both the pub and the local shop that my parents ran now no longer exist, though local family businesses in retail and food services have often been kept alive by

immigrant populations (often Asian and East European, catering to "ethnic" markets and/or prepared to work long and unsocial hours).

It is fashionable these days to label transformations numerically. The service industries of the first half of the twentieth century can be characterised as *Service Industry 1.0*. Service Industry 1.0 reflected early industrialisation: the world of factories, of mass production and increasingly mass consumption and communication. Manufacturing industries and services such as transport had been and were continuing to be transformed through the application of steam and then petroleum and electric power systems. International service firms had existed at least since the emergence of mercantile capitalism centuries before, not least to facilitate the West's access to resources from colonised regions of the world. Industrial capitalism had created markets for standardised commodities, and by the middle of the twentieth century, multinational companies were evident in services as well as in fields like mining and energy industries and in automotive and other manufacturing industries. Mid-century service activities followed traditional lines in many ways, supported by equipment of various kinds that had been developed, for the most part, by the early years of the century. (Perhaps the big exception was medical services, where tools such as antibiotics were hugely important – one of my early memories is a penicillin injection when I'd contracted pneumonia.) To longstanding systems for physical transport and the electronic systems of telephony were added radio/TV broadcasting.

1.4 Service Economy 2.0

Large-scale fast-food chains and coffee shops represent classic examples of the industrialisation of services (with mass production and various forms of standardisation and mass customisation); supermarkets combine product standardisation in the form of pre-packaged foodstuffs, etc. and wide product variety desired by more cosmopolitan and affluent consumers, with self-service organisation (shopping trolleys and now self-checkout). Together with liberalisation of opening hours, and new lifestyle patterns associated with women's employment and rising affluence, such developments were prominent well before the end of the twentieth century. At the same time, large-scale use of consumer goods ranging from the mechanical (motor cars, washing machines, vacuum cleaners) to the electronic (televisions, video recorders, and by the end of the century videogame consoles and home computers) also led to some substitution of consumer provision of transport, domestic and leisure services for purchases of public transport, laundry and out-of-home entertainment services. (While microwave cookers and "ready meals" did make inroads, the fast-food industry managed to boom – possibly because it offers more by way of leisure and social opportunities than does spooning out hot food from a plastic container.)

These trends were ones that I began to think about seriously in the 1980s. Having decided that the psychology professions were not for me, my academic career had

led me to join a pioneering research centre working on what came to be known as innovation studies. I was surrounded by inspiring colleagues, among whom Jonathan (Jay) Gershuny brought keen analytic skills to the study of the service economy. In particular, he stressed the shift to "consumer self-services" and the scope for service industries to reinvent themselves through innovation (especially involving new IT). Our joint project at the beginning of the 1980s[2] was the occasion for the first use of a word processor in our research centre. It was the trigger for a major debate on job roles and working conditions. Concerns included the possible degradation or replacement of secretarial work and the health and ergonomic issues associated with intensive keyboard use. (I myself later suffered painful effects of repetitive strain injury after a decade or so of using personal computers; we researchers were less skilled in keyboard technique and less scrupulous about our posture and hours of keyboarding.) Concerns about the introduction of microelectronics into workplaces led to a wave of "new technology agreements" across Western Europe, which often resulted in workers accepting the use of personal computers, computer-controlled processes and robotics and similar equipment in exchange for improvements in working conditions. In our own centre, all staff were equipped with PCs after a few years, though some of the researchers were initially resistant to using these.

Ultimately there were major changes in the workforce and pattern of work across the economy. While managers and professionals have themselves largely overcome their early reluctance to undertake keyboard work, the share of secretarial staff in the workforce has declined, with some remaining jobs upgraded (requiring many more computer software-related skills) and some turned into more repetitive data entry roles. (We should also mention the relocation of more routine information-processing work away from the main organisation to lower-wage areas of the country or to developing countries, a move facilitated by telecommunications). Many other service jobs have been transformed. My father's role was among many in telecommunications that disappeared as telephone systems were digitalised, for example. On the consumer side, cash machines outside banks allowed for access to funds on a 24-hour basis, and supermarkets allowed for more choice and (when uncrowded) more efficient shopping. Digitalisation was affecting retailing through bar codes, electronic cash registers and cashless payment, as well as backstage developments like automated stock control and warehousing.

By the 1980s–1990s, these transformations were so substantial that we can talk about the emergence of *Service Industry 2.0*, in the terms introduced earlier; and already by the first decades of the twenty-first century, the Western world – and large swathes of the East (including much of China, Japan, Korea and some other countries) – was already restructuring service activities into Service Industry 3.0.

Service industry 2.0 rested on a series of technological and organisational transformations, enabling the growth of large firms in many areas of service – especially financial and trade services (banks, insurance, wholesale, retail, etc.). Much digitalisation was underway in the back offices of large organisations; their front office service workers were increasingly using networked terminals to access customer

[2] The major output was Gershuny and Miles (1983).

account and product information, while customers could access some services through voice telephone connection with staff equipped with such terminals and through terminals such as cashpoints. Professionals of all sorts, including those in professional and creative services such as architecture, accountancy, engineering and legal services, were using tools as various as computer-aided design, online databases and forms and templates for correspondence and presentations routinely – even in small firms and voluntary organisations.

In the UK, considerable social change was underway. The rise of what has become known as neoliberalism resulted in a wide range of developments. The early 1980s saw major declines in manufacturing industry employment and in the power and membership of trade unions. In contrast, commentators noted the rise of the "yuppies" – young urban professionals, often achieving wealth and social mobility through activity in the booming and newly liberalised financial service sector. (The term had been coined in the USA in the early 1980s but was soon in use in the UK, where it was tied up with British class attitudes – the stereotypical yuppie, if not the statistically representative one, came from a working class origin.)

Public services in general continued to expand and have been a major source of women's employment and social mobility (thus my sister was a schoolteacher in this period, while I was working in a university). Public services remained the most highly unionised parts of the economy. But these services were under increasing pressure as the neoliberal view portrayed them as drains upon truly wealth-creating activities. Digitalisation in the public sector was mostly confined to back office record-processing, though expensive computer-aided tools like CT and MRI scanners were in use in major hospitals. From the early 1980s, schools were encouraged to introduce computers into classroom environments; I recall teachers complaining about the inadequacy of the training and other support they received as to how to integrate the technology meaningfully into lessons. Claims that education with and for information technology was inadequate were repeated often during the decade, and in the late 1990s, a new UK government undertook another large push to improve the situation.

Educational technology, together with TV programmes and much press coverage of "home computers", doubtlessly helped fuel a major growth in acquisition and use of computers by consumers – admittedly, much of the demand reflected children's wish to play videogames. Home computers followed a range of designs, which was initially the case in industrial settings; the IBM PC standard only became dominant in industry late in the 1980s and took longer to enter UK consumer markets. Home computers were widely adopted through the decade, though these (a) often required some programming skills to make much use of, since graphical user interfaces and pointing devices were yet to be commercialised, and (b) were generally stand-alone devices, with consumers and professionals typically exchanging software and data via the medium of floppy discs. Email was mainly an internal affair for large organisations; fax machines were beginning their short period of widespread use.

Prestel was the UK's pioneering attempt to launch online networking, through the system known as videotex. Initially using dedicated terminals attached to the TV and telephone, Prestel was a costly failure in the 1980s, achieving tens of thousands rather than millions of users. Only in France did videotex – the Teletel/Minitel sys-

tem – take off. It helped that its terminals were provided free of charge and did not require use of the TV or phone line. But also, the UK system was designed very much as a top-down provision of information to the public, while the French system, from the start, encouraged peer-to-peer communication and the entry of new services and service providers.[3] I was among the few in the UK who acquired modems to attach their home computers to the Prestel system; it was underwhelming, though it did find niche use in certain service industries. One travel firm's gain in market share has been plausibly attributed to their providing information on offers to travel agents, who had previously been laboriously telephoning various suppliers often while interfacing with customers who were providing their own requirements and reactions.

The job of the travel agent was one which could already be seen to be threatened, as the scope grew for consumers to undertake their own exploration of airline and holiday firm offerings (or to use new online intermediaries to do this). Even more threat was perceived by the recorded music industry, which belatedly realised that millions of consumers were exchanging MP3 versions of recordings via using online peer-to-peer file sharing systems – the most famous in the late 1990s being Napster, which by 2001 has over 25 million users. As books and movies were also becoming available in digital versions, these publishing industries also seemed threatened.

1.5 Service Economy 3.0

What played a major role in the realisation of these threats was the development of *Service Economy 3.0* and in particular the uptake of the Internet and the creation of the World Wide Web together with the browsers and search engines that opened up access to the huge potential of online services. The uptake of the Internet accelerated during the 1990s. The "dot.com bubble" that burst in the early 2000s reflected the unrealistic expectations of many investors concerning rapid expansion of the profits to be by firms (especially new entrants) offering new online services. While the epicentre of this bubble was the USA, there was also feverish anticipation underway in the UK – I recall meetings during which participants from service and technology firms were being called away to discuss huge financial deals. Actually, they were no longer physically called away, since business was now being conducted on mobile phones; however, they would absent themselves momentarily from our face-to-face contacts. As well as demonstrating the volatile excitement of the "Internet revolution", this was early evidence of the emergence of an "always on-always connected" environment – and of the challenges of managing the demands of virtual communications and traditional presence.

UK telecommunication liberalisation officially began in the mid-1980s, when British Telecom was privatised and limited competition introduced on landlines.

[3] I studied this development in real time: see Thomas and Miles (1989).

Mobile phone costs began falling and performance increasing in the 1990s, and in 2000 an auction determined which industry consortia would compete in offering 3G mobile services, and by the early 2010s 4G services were underway (and planning for 5G is advanced). Mobile phones evolved over this period, from basic and cumbersome handsets into powerful and attractive smartphones. The latter essentially provide much of the capability of computers, including internet access: they are the source of a great deal of consumer-generated content that is circulated on social media and is increasingly used in e-commerce. Many new devices with computing and communications came into play, with various tablets competing/converging wit) laptop PCs.

In this environment, and despite the bursting of the dot.com bubble, online services have taken a substantial hold. The UK high street has been transformed by the growth of e-commerce; bookstores and many other retail outlets have found their customer base eroded by online retailers (notably Amazon); the video rental stores have practically disappeared, and both music and movies are now downloaded by many consumers or accessed by a plethora of new radio, TV or Internet channels. The first point of call for those requiring many professional services – and even medical advice – will be online services. New social media have become immensely popular as ways of maintaining social contacts and establishing virtual social networks, with one-to-one voice, text and video being accompanies with one-to-many and many-to-many connections (often sharing content produced by others – including advertising and news media content, leaving traditional advertisers and publishers seeking new revenue streams).

The service economy has been as implicated in the generation of environmental problems as has classic industrialism. Hopes that a world using information technology would consume fewer resources and generate less greenhouse gas have been largely displaced by concerns about the demand for scarce materials needed for smartphones and the vast energy consumption associated with the servers that underpin the Internet. Telecommunications have not displaced transport; while vehicles may be more energy-efficient, vehicle use has expanded as travel demand has grown. A few voices expressed vociferous concern about environmental damage even before Service Economy 2.0 had really come into being. But it has been during Service Economy 3.0 that the prospect of climate change became widely accepted and international efforts to limit the extent of change moved to centre stage.

Four developments stand out in Service Economy 3.0. First is the growth of online services, accessed via a plethora of desktop and portable/mobile consumer devices. Among these services are those that allow for individuals to be connected pervasively to social networks, email services and the like. While this has undoubted benefits, concern is mounting about “Internet addiction” as users incessantly check their smartphones for updates, and many employees find themselves being continually accessible to their employers, increasing stress and undermining what work-life balance they have achieved.

A second feature is the importance of platforms – by which I mean not the railway platforms of my childhood but the service providers and standards that allow for person-to-person and online service supplier-to-user interactions. The web itself

is a platform, on which other platforms operate – some are themselves mainly service providers who also provide marketplaces for other providers (e.g. Amazon, eBay) and who will often allow for consumers to share information (e.g. about service quality); some are more focused on peer-to-peer communications (e.g. often funded via advertising, as in the case of Facebook and YouTube, or by sharing revenues as in auction sites like eBay and retail portals operating in travel agency-type services and fine arts and fashion sales) and various other types of "sharing economy" services such as Uber (based around revenue from "ordinary motorists" offering their services as informal taxi drivers). In some areas of service activities, there are numerous platforms available, but many are dominated by one or two players, and the largest players in fields like social media and search are now among the world's largest companies. Intermediation between final service suppliers and customers is often a matter of US firms, who have come to control vast quantities of data on their users – an invaluable resource for advertisers (and it emerges, for political propagandists and state agents). Availability of stored data on us as individuals means that we can receive personalised services efficiently and rapidly, which is particularly important when we require emergency services and convenient when more routine public services. While there have been major improvements in data interchange within health systems (e.g. digital X-ray results immediately moved across hospital departments, nurses with tablets having access to patient records), continuing difficulties – not least those associated with privacy and security issues – are encountered in establishing, for example, patient health records.

Third, as already touched upon, is the development of "sharing economy" and consumer coproduction activities of many forms. Much content is generated and exchanged among users of networked technologies, ranging from personal trivia to substantial works of art and from entertainment and gaming performance to content providing insight into experiences and substance in practically all spheres of craft, industry, science and technology and professional activities. People confronting problems can often find advice and other forms of support via online sources; professionals often find that their clients (and students, patients, etc.) are coming to them forearmed with knowledge of the sorts of help they might expect.

Fourth, one of the striking features of the early twenty-first century, has been the growth of inequality in many Western societies, reversing a trend that had seemed well-established in earlier decades. Numerous studies have tracked the phenomenon of polarisation in the workforce – divergence in wages between the top and bottom wage-earners but also, in many cases, a relative growth in the shares of the workforce at both top and bottom and a decline in middle-level jobs. This has meant that we see relatively more senior professionals and top managers, and at the same time relatively more people engaged in fairly mundane personal services and in sectors like fast food. Jobs that can more readily be offshored or automated – routine information-processing, for example – have decreased.

Broader features of the global economy have shaped and are continuing to Service Economy 3.0, in important ways. Excessive financialisation of the economy led to a severe economic crisis that became evident when the "Great Recession" imploded in 2008; the UK, with its high dependence on financial services, was

badly hit by this. One result was the election of a conservative government whose "austerity" programme was a rationale for further pressure on public services. Particular public concern was expressed concerning health services – the National Health Service had become the world's third largest employer, with over a million employees, but was facing escalating challenges associated with rising medical costs (some associated with expensive new treatments), an ageing population, changing living patterns (e.g. more single-person households) and the lack of an adequate social care system to support elderly and disabled people. Another significant change was the rise of China as an economic superpower, with impacts on politics and culture impacts, as well as on trade and investment. The full scope of these impacts has yet to be worked through but is likely to be profound – and more extensive than the considerable Asian cultural influences that are already apparent in food and entertainment services and in some areas of medicine and spiritual practice. Austerity and globalisation have fuelled a growth in populism and xenophobia. These are augmented by, on the one hand, responses to immigration and refugee crises and, on the other, by the use of social media (and some sections of traditional mass media) to promote angry discourse and intolerant behaviour.

1.6 Looking Forward

The contours of Service Economy 3.0 are still being consolidated, but already many signs of *Service Economy 4.0* are emerging. One evident source of further transformations relates to advances in science and technology that permit new services and new ways of performing service. Artificial intelligence and machine learning may well be the subject of considerable hype. But they are being seriously and extensively explored as tools to automate elements of professional work and to add the sorts of capability that come from large-scale data analytics. Additionally, professional activities may also be challenged and complemented by self-service on the part of clients themselves using automated systems and social networks for support. Professionals may not disappear, but it is more plausible that the numbers of some types of professional and especially of their associates and assistants will be reduced. The work of almost all types of professional will increasingly involve the use of decision support systems.[4] When it comes to jobs that involve physical dexterity, we may expect robotics of various kinds to play growing roles in tasks as varied as surgery and personal service (the latter including the physical components of social care). The promises of biomedical information systems, and their incorporation of genomic and other data, are likely to render the idea of personalised medicine more of a reality. More precise and tailored treatments should come into play, though this may not necessarily cheapen healthcare! Neurotechnologies may be utilised as means of understanding and ameliorating problems such as memory loss and mood

[4] For a provocative account of the prospects for professional work, see Susskind and Susskind (2015).

disorders; the same technologies may be incorporated into education, entertainment and even sports; and businesses are liable to employ the knowledge gleaned from neuroscience to better understand and influence reactions to marketing and other interactions with consumers and regulators.

Many other technological developments are looming, including those associated with new materials and devices such as 3-D printers (a world of services supplying designs to decentralised manufacturers? What platforms would emerge?); automated vehicles (a shift from car ownership to automated taxis? new modes of delivery of consumer goods and food services?); the Internet of Things (including wearable and implantable devices that can support health and well-being, as well as "smart" buildings); and many more. It is possible to speculate at length about how service activities can be further transformed by such developments and what they might require by way of human-centred design in order to benefit service workers and users.

But factors other than technological innovation play an important role. This essay has already mentioned several – including geopolitics, ageing societies and political attitudes to public services and problems associated with financialisation and polarisation. The scope for social innovation cannot be discounted – new ways of living together, for example, that could reduce loneliness, isolation and lack of social care.

The elephant in the room is climate change. Numerous grand challenges confront humanity, of course. But the emission of greenhouse gases by our industrial and service economies has given rise to this, the greatest of challenges (followed closely by the proliferation of nuclear and other weapons of mass destruction). We now confront a spectrum of scenarios. One end of the spectrum involves substantial restructuring of our socioeconomic systems to reduce greenhouse gas emissions and promote sustainable use of resources. Even in such futures, we will need to adapt our societies to deal with the impacts of relatively small rises in global temperatures. At the other end are the consequences of climate change associated with runaway global warming, with huge social and economic costs, and the attendant possibility of moving into a disastrous "hothouse Earth" scenario.[5] In either case, there would need to be substantial re-engineering of the service systems that we rely on. Efforts to further human-centred digitalisation may be overwhelmed by acute crises, shifting the focus of attention to mere survival, across large areas of the spectrum of scenarios. There are good reasons for thinking that scenarios where we are seriously attempting to maintain what ecosystems analysts have labelled a "stabilised Earth" are the ones where there are best prospects for such designs of digital services. These are scenarios where we may anticipate, too, a growth in the "climate services" required to support the restricting of emissions and the maintenance of biodiversity and sustainable ecosystems.[6]

[5] See the striking analysis in Steffen et al. (2018).

[6] "Climate services" are human actions intended to limit climate change (whether geoengineering is one of these is debatable). They should not be confused with "ecosystem services", which refer to the benefits that the natural environment provides us with, such as fresh air and much else. This latter construct is anathema to those adhering to versions of "service-dominant logic" that see

The service economy has undergone huge transformations over the last century: those to be expected in the decades to come are even larger. For these to support human-centred digitalisation, the trajectories of change will have to substantially break from those established in the nineteenth and twentieth centuries.

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service as a uniquely human activity. On the other hand, it is seized upon by those that would like to attach a value to these benefits, so that the costs of losing them can be incorporated into economics.

[7] This essay is in large part based on personal experiences, and proper documentation of all of the transformations discussed here would fill many pages. Some of the key texts drawn on, however, are listed as references here.

Chapter 2
Human-Centric Service Co-innovation in Public Services from a Practice-Based Perspective: A Case of Elderly Care

Lars Fuglsang

Abstract Human-centric service innovation in public services means that citizens' needs, knowledge, and experiences are taken as sources of innovation (Feurstein et al. 2008). Several methodologies have been applied to understand and capture citizens' needs, knowledge, and experiences. These include focus groups, living labs, and democratic experiments. The aim of this chapter is to explore how a practice-based approach could contribute to a human-centric perspective on service innovation, particularly emphasizing innovation in public services. A practice-based approach recognizes the messy reality of everyday life, the difficulties in controlling the knowledge required for the innovation process, and the real practices of co-innovation. Innovation is not a readymade entity from the beginning, or a specific procedure, but rather an accomplishment. Managers and practitioners would probably prefer linearized models of innovation instead of messy realities. Nevertheless, the chapter finds that managers and employees can have an interest in working with a practice-based approach to mobilize citizens for service co-innovation. The chapter discusses how human-centric service innovation is integrated with co-production in public services, defines how a practice-based model treats knowledge and learning, demonstrates findings from a case study of public services, and discusses the advantage of the practice-based model from a managerial, an employee, and a societal perspective.

Keywords Public service innovation · Human-centric innovation · Practice-based theory · Co-production

L. Fuglsang (✉)
Roskilde University, Roskilde, Denmark
e-mail: fuglsang@ruc.dk

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2.1 Introduction

Human-centric service innovation in public services means that citizens' needs, knowledge, and experiences, individual and/or collective, are taken as sources of innovation (Feurstein et al. 2008). Citizens can create new services themselves, such as parents creating a new school for their children. Or they can be invited as end-users into an innovation process of a (public or private) service provider. Involving end-users in service innovation processes has been emphasized in such areas of research as design science, cooperative and participatory design, social experiments, user-based innovation research, co-production/co-creation research, living/innovation labs research, and more. The rationale of human-centric service innovation is to increase the relevance of services for specific users or user groups. Moreover, it no longer appears entirely feasible for organizations to provide standardized in-house produced services for end-users; services have to be created in collaboration with end-users. However, the question arises as to how end-users are really involved in the innovation process, beyond giving feedback to providers or as co-producers of a service.

Human-centric approaches imply difficult processes of active or re-active involvement of end-users into service co-innovation processes. There has been a search for organizational manifestations such as lab-like activities. This includes living lab activities that have been promoted in the EU since 2006 (Dutilleul et al. 2010). Living labs are multi-stakeholder organizations of development, testing, and real-life experimentation with innovation (Schuurman and Tõnurist 2017). In living lab research, Ståhlbröst (2008) defines human-centric approaches to innovation in contrast to technology-centric approaches. "In these processes, users are invited to participate in the innovation and development process in their own context in authentic usage situations, facilitating the users to gain deep understanding of how a new product or service will function and correlate to their context based on their own lived experience" (Ståhlbröst 2008, p. 32).

However, the literature of public innovation emphasizes that these lab-like human-centric innovation activities tend to be experimental projects with a high mortality rate. They are highly dependent on project support (Nesti 2017). Highly organized forms of human-centric co-innovation activities may therefore tend to be short-lived, having to repeatedly reinvent themselves and struggling for legitimacy vis-à-vis mainstream public sector activities (Tõnurist et al. 2017). Thus, arguably there is a need for a more practice-based understanding that explores the everyday practices of human-centric innovation – asking: what are the practices of human-centric innovation? This calls for a practice-based approach to human-centric innovation – i.e., an approach that has its focal point as everyday actions related to social worlds (Feldman and Orlikowski 2011). In the practice-based approach, the real practices of innovation need to be identified – those that are not necessarily highlighted by human-centric projects. Furthermore, this approach also stresses that innovation does not need to be linearized, structured, or formalized to count as innovation (Alam and Perry 2002; Brown 2008; Simon 1996; Edquist 2005; Cooper

1990). Innovation can emerge more invisibly from interactive processes that involve many and different actors over time in processes of doing and using (Jensen et al. 2007) or through bricolage activity (Fuglsang and Sørensen 2011).

This chapter first defines three approaches to human-centric service innovation in public services, drawing on the literature on co-production as a context for innovation: an individual approach, a group approach, and a collective approach. Next, the chapter defines a practice-based approach to service innovation and seeks to tentatively define how human-centric approaches are tied to innovative practices in organizations. The chapter then tentatively outlines a typology of human-centric innovation practices. This can be useful as a sensitizing device for further research and for managers to map human-centric practices in their organization. Finally, this framework is then explored in the practical context of a case study with some preliminary findings, and the contribution to research is discussed.

2.2 Defining Human-Centric Service Innovation and Its Context

Innovation is the realization of new ideas in practice. In research on services, Sundbo defines innovation as "the effort to develop an element that has already been invented, so that it has a practical commercial use, and to gain the acceptance of this element" (Sundbo 1998, p. 12). This corresponds to the Schumpeterian tradition of studying innovation that makes a distinction between invention (getting an idea) and an innovation, the first occurrence of carrying out that idea into practice (Fagerberg 2005). A service innovation must represent something discontinuously new that can be repeated over time to count as innovation. This new can, however, be incremental small-step changes as well as more radical changes (Sundbo 1997).

A related definition of service innovation is provided by the service marketing literature. Innovation can be defined as the development of new value propositions (Skålén et al. 2015). This definition avoids the somewhat problematic distinction between process and product innovation that we find in the general innovation literature. In services, the product can be a process. Skålén et al. (2015) also makes a distinction between structured (systematic, linear) and practice-based innovation processes (emerging from practice).

Human-centric innovation is co-innovation activities with end-users. In public services, end-users are citizens. In the private sector, they are customers. To understand the context of co-innovation, some authors relate co-innovation with co-production of services. Co-production is seen as a necessary aspect of public service delivery because end-users have to do at least part of the work to produce the service. Bovaird and Loeffler (2012) distinguish between co-production that either substitutes or complements public services, i.e., some services can be produced entirely by citizens in collaboration with public authorities (like parents developing a public school for their children). Some authors define co-production as a deliberate activity (Brudney and England 1983; Nabatchi et al. 2017). However, in the context

of public services, it can be obligatory and required (Alford and O'Flynn 2012) – like when school children are required to do their homework.

Voorberg et al. (2015) point out that co-creation and co-production have been used as interchangeable concepts. They define co-creation as "the active involvement of end-users in various stages of the production process." They argue that co-creation is about involving citizens in co-initiation and co-design of services whereas co-production is more about co-implementation with citizens. Some authors find that co-production/co-creation is implicitly intertwined with the concept of innovation (Voorberg et al. 2015). Others see (co)innovation as a subcomponent of co-production along with co-design, co-initiation, co-implementation, co-construction, and more (Osborne et al. 2016). End-users can be involved in co-production as individuals and as communities (Bovaird and Loeffler 2012). Nabatchi et al. (2017) elaborating on Brudney and England (1983) distinguish between individual, group, and collective co-production which could be seen as different contexts for co-innovation.

The literature on co-production overlaps with the service marketing literature or service logic literature on value co-creation (Grönroos and Voima 2013). This literature emphasizes the value creation of the user. Providers can be invited into the value creation process of the user and become co-creator of end-user value. However, the concept of co-production has been used in the public service literature. It tends to focus more on the productive behavior performed by the end-user, rather than the value creation. This chapter considers behavioral changes related to innovation, rather than value creation as such, and will therefore mainly refer to co-production. However, co-production is a platform for value creation and a context of co-innovation. The structure of co-production changes along with co-innovation by changing the behavior of the end-user and the provider.

Overall, co-production with citizens can be seen as a context for co-innovation in public services. In the following, co-production and co-innovation are seen as integrated phenomena: *Co-production is the real-life context of service delivery from which co-innovation activities can emerge*. The following draws on Nabatchi et al.'s (2017) distinction between individual, group, and collective co-production to outline such real-life contexts. Three different contexts of human-centric co-innovation are provided:

Individual Human-Centric Co-Innovation The service marketing literature has stressed that service providers, including public providers, can interact with individual end-users of services during co-production in order to understand their value creation and co-create value with them (Grönroos and Voima 2013). There are many ways in which this can happen. Frontline employees (FLEs) interact with end-users and collect knowledge about their needs, knowledge, and experiences. FLEs can change a service on the spot by responding to end-user needs (Fuglsang 2011). Techniques for interpretation of end-users' value creation can be created (Helkkula et al. 2012). The interaction with end-users can also be more organized. For example, test-beds or close to real-life experiments can be organized where service providers test services and technologies and receive feedback from end-users during a

close to real-life co-production situation (Ståhlbröst 2008). Feedback can be retrieved from dialogue with users, interviews, observations, or surveys or by interacting with individual users over time when an employee and a user get to know each other well.

Group Human-Centric Innovation A group of co-producers is constituted by a number of users who receive a given service, such as receiving primary care (Karlson 2018) and education, shopping in a supermarket, or attending an experience in Tivoli (Jensen and Sørensen 2018). Activities can be organized that involve groups of service receivers in co-production and co-innovation. For example, pupils in a school and their parents constitute a group of co-producers of the daily lunch of the children. They can be involved in developing a school meal (Palumbo et al. 2018). A nurse can be involved with a particular group of patient-co-producers, such as cancer patients, in a particular area to gain knowledge about their particular needs and develop treatment for the benefit of that group. Public authorities can collaborate with a group of elderly in a neighborhood to provide IT services adapted to the needs of the elderly persons. Group innovation is about working together with a particular group of service co-producers toward a common goal that benefits this particular group.

Collective Human-Centric Innovation In collective human-centric innovation, end-users are involved in prioritizing services for the benefit of the whole community (Nabatchi et al. 2017). For example, a local community can create hiking routes together with tourism companies and public authorities for the benefit of the whole community and tourists. Collective human-centric approaches can also take more democratic forms. Integrated area development (IAD) and other projects mentioned by Frank Moulaert (Van Dyck and Van den Broeck 2013; Moulaert et al. 2013) and participatory design (Björgvinsson et al. 2010) are examples mentioned in the literature of democratic approaches to human-centric innovation. For example, integrated area development is referred to as a project about social innovation emphasizing need satisfaction, social relations, and empowerment in a spatial context. Focus is on building development strategies in a local area across diverse public and private actors with different interests thus seeking to provide strategies for overcoming fragmentation and disintegration in urban space. Similarly, Pelle Ehn and his colleagues refer to Malmö living lab as a project in which democratic participatory design has been attempted (Björgvinsson et al. 2010). Their point of reference is Chantal Mouffe's (Mouffe 2000) agonistic approach in which many voices are engaged and empowered in a struggle for hegemony. However, collective approaches to human-centric innovation can also be small-organization/firm-driven initiatives in which firms, public sector representatives, citizens, and researcher come together to create local development, for example, in tourism.

The three approaches mentioned above emphasize different characteristics of end-user involvement in co-production and co-innovation. In the individual approach, the end-user is the subject of observation and interpretation. In the group

approach, a group of end-users of a particular service are actively involved in the co-production and co-innovation of a service in a living context. In the collective approach, end-users are empowered to express their voice and contribute to strategies of development and prioritizations for the common good.

2.3 Toward a Practice-Based Approach to Human-Centric Innovation

Human-centric innovation in public services can be seen as innovation processes that emerge from the real-life context of service delivery and co-production with end-users. So far, three contexts of co-production and co-innovation have been outlined. However, innovation involves innovative practices related to social and professional worlds that are not very accurately described above. The following draws on practice-based theory as a research strategy for better describing these activities by linking the concept of innovation to the concept of everyday practice. The following draws on Fuglsang (2018).

Practice-based theory argues that practices should be taken as the unit of analysis. Giddens argues, for example, that practice is the basic domain of study of social sciences. Practices mediate between structure and agency (Giddens 1984). This means that human activities are not seen as something which are controlled or possessed by individual actors, such as an entrepreneur, a manager, or an employee. Human activities are embedded in wider social practices. On the other hand, practices do not exist independently of human activities, as may be assumed by structuralist analyses of society focusing on material and economic conditions. Practices are seen as continuously enacted, elaborated, maintained, reinterpreted, changed, and disrupted by human actors. Changing a practice also changes the way people make sense of their social environment. Thus, a practice-based approach to innovation underlines the messy reality of everyday life, for example, how innovation is intertwined with working and learning activities (Brown and Duguid 1991). Innovation is not always a straight-forward linear process from idea to practice, but rather an accomplishment. A human-centric approach would, from this perspective, have to take account of the messy reality of practitioners in which the knowledge, materiality, and time required for the innovation process have to be available and be integrated to form a practice.

Practice refers to organized and organizing activities (Nicolini and Monteiro 2017). The literature defines it as "a mode, relatively stable in time and socially recognized, of ordering heterogeneous items into a coherent set" (Gherardi 2006, p. 34). Another author emphasizes the varied elements of practice as "bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge" (Reckwitz 2002, p. 249f). Furthermore, the literature links practices to purpose (Schatzki 2002) and meaning in providing "order and meaning to a set of

otherwise banal activities" (Lounsbury and Crumley 2007). Not all activities are practices. Only habitual behaviors oriented toward a purpose that appear meaningful to the actors and are repeated over time are practices. It includes modes of working, eating, or transporting (cf. Nicolini and Monteiro 2017); sleeping has also been mentioned as a practice (de Souza Bispo 2016; see also Fuglsang 2018).

Following Latour (2005), practice-based research has its main focus on how practices are made durable (Nicolini 2009b). This is similar to innovation theories; however many empirical studies of innovation tend to have their main focus on the initial stages of innovation (Eide et al. 2017). Practice theory would emphasize how ideas become integrated in real-life practices, for example, in terms of actor-network, translation, or domestication processes. New or changed ideas and procedures must be accepted, learned and integrated into everyday life or work (Brown and Duguid 1991). There are many challenges: the knowledge and skills required for a practice to take place must be shared within a community of practitioners (Wenger 2000); knowledge has a tacit component which can be difficult to share across practices even within the same organization. For example, adopting new practices across employees' and management's practices can present difficulties of engagement and understanding. A new practice also requires practicing – that is, rehearsing and refining in order to accomplish its purpose (Antonacopoulou 2008). This requires time and money. Practices may not fulfill their purpose and they can be contested and subject of critique. As a consequence, practices may change in response to critique (Engeström et al. 1999).

To summarize, practice can be seen as coherent, co-operative human activity. A practice is not necessarily highly institutionalized. Practices are multiple (Law and Singleton 2005), i.e., changing all the time and therefore difficult to capture both in research and for managers. Practices are continually problematized phenomena. They are problematized by the practitioners themselves or by others that are affected by them.

Methodologically it is challenging to study practices. One can attempt to make practitioners speak about their practice by various interview techniques (Nicolini 2009a). Speaking of practice can create a form of self-awareness of practice that allows the researcher and the practitioner to understand the many facets that are part of a practice. This can empower the practitioner. Studying practice through observations and interviewing may lead the researcher to reframe important notions of practice when a practice appears different from what was expected (Alvesson and Kärreman 2007). The researcher can develop a "sense pratique" (Bourdieu 1980) that allows the researcher to use studies of real practices to formulate and reframe theories.

Nicolini suggests that sensitizing concepts are needed or "a lexicon and a method for interrogating practices as constitutive of organizational and social phenomena." Thus, researcher can be "'zooming in on' and 'zooming out of' practice … through magnifying or blowing up the details of practice" (Nicolini 2009b, p. 1412). In service research, Warde (2005) has tried to decompose practice into its constitutive elements: Practices are cohesive due to three components: procedures, understandings and engagements. Similarly, Schau et al. (2009) claim that practices are composed

of procedures, understandings, and emotionally charged engagements (Schau et al. 2009; Echeverri and Skålén 2011). Pantzar and Shove (2010) suggest that a practice consists of materials, skills, and images that are integrated to form a practice. They define innovation as the integration of such elements in new practices.

However, this research does not specify any constitutive elements of practices of innovation. Rather, practices, decomposed into such elements as procedures, understandings, and engagements, are what is to be innovated. Thus, there is a need to identify and better understand *the practices of innovation.* An innovation-as-practice approach similar to the strategy-as-practice approach (Jarzabkowski et al. 2007) can be formulated as a research strategy that aims to identify the practices through which innovation emerge and what they consist of, including the practices of human-centric innovation. The following section tentatively presents such a sensitizing framework by drawing of varied social science theories and research on innovation (the following draws heavily on Fuglsang 2018).

2.4 Practices of Innovation

The following seeks to tentatively expand upon a model for innovative practices drawing on sociological theories and theories of service innovation.

Fuglsang (2018) argues that three interactive practices of service innovation can be distinguished. These are (1) the immediate service practice in a familiar context, (2) a planning practice in which the relation to a broader set of actors is considered, and (3) a systemic practice in which a wider set of societal actors are in focus. This framework is derived from the practice-based theory stated by Thévenot (2001) where three notions of engagement of an actor in her environment are listed: familiar engagement, engagement in plan and engagement in justifiable action. Slightly different concepts have been developed by Luhmann (see, e.g., Luhmann 2002; Tyulenev 2012) who speaks of first-order, second-order, and third-order approaches as the three ways in which an actor can relate to the environment. Similarly, Peirce's theory of categories (1998) lists three approaches of an actor to the environment, which he calls firstness, secondness, and thirdness. There are many nuances and differences between these three forms of cognition and interaction stipulated in the literature. Yet, they refer to similar ways in which an actor can be engaged in the environment that may be adopted to study service relation and service innovation.

Thus, a service provider may be engaged in a relation to a particular user in a familiar context using resources with which this person is familiar and at ease. This is a relation of firstness or first-order or familiar engagement in the environment. The environment appears as a bricolage of all kinds of things that can be used for the service relation, like in one's home. Second, a service provider may be engaged in plan seeking to codify the elements that are part of the service relation. This requires "investment in form" (Thévenot 2001) and a more reflexive consideration about what the service relation is about according to certain strategies, standards, and procedures that can be codified and recognized at a distance. Third, a service

provider can be engaged in justifiable action. For example, there can be a dispute about whether the service lives up to the promised standards that requires justification.

It may be argued that these approaches correspond to three innovative practices related to different spheres of interaction and engagement. We call them (1) the bricolage approach, (2) the system approach, and (3) the systemic approach (see Fuglsang 2018).

(1). The bricolage approach. Bricolage is a concept that has been used in research to explain how innovation can happen under resource constraints (Baker and Nelson 2005; Di Domenico et al. 2010; Fuglsang and Sørensen 2011; Witell et al. 2017). Bricolage means to make do with whatever is at hand, i.e., solving problems on the spot with the resources at hand. This can be relevant for small firms that do not have extensive resources to invest in innovation (Witell et al. 2017). Bricolage is not necessarily innovation but may be a path to innovation if the bricolage act is made more visible to practitioners in an organization and repeated several times. Bricolage has been contrasted with R&D-based breakthrough model of innovation (Garud and Karnoe 2003). The bricolage model may be relevant to many service firms that do not have R&D departments (Witell et al. 2017). In service firms, the daily interaction between frontline employees and customers can be an important driver of innovation. The bricolage approach has also demonstrated its importance in public services (Bugge and Bloch 2016; Fuglsang and Sørensen 2011). From two surveys where respondents give examples of innovation, Bugge and Bloch (2016) find that 1/3 of the examples given are bricolage type while only about 10% are systemic.

(2). The system approach. While innovations may develop from many sources, taking a more selective approach to innovation may be crucial for an organizations' survival and growth (Baker and Nelson 2005). Practices that focus on an organizational system can be strategizing practices (Jarzabkowski et al. 2007). They represent an engagement in planning which requires "investment in form" (Thévenot 2001). They are practices that make innovation more goal-oriented and reflexive of organizational strategies as well as individual carrier plans. They make an actor able to communicate and express what innovation is about; what the business model is; what the contribution, purpose, and goals are; what the relevant standards are; and how the innovation process is supposed to take place. Thus, they project the innovation activity into the future. Such practices can be found at several levels in an organization including the policy and strategy level but may also involve employees' and end-users' opinions and reflect employees' practices (Fuglsang and Sundbo 2005). System-oriented, strategizing innovation practices are generally seen as important to innovation (Skålén et al. 2013), because they represent a choice and clarification of direction.

(3). The systemic approach. Another set of practices focus on the relation between an organization and its environment. Thus, the systemic context of innovation

is a different context than the organizational context as such. We can therefore speak of engagements and practices that address the systemic level. Actors engage in various strategies of antagonism, justification, marketing, and compromising in order to attract funding, legitimize an innovation, and stabilize practices in a societal context. Boltanski and Thévenot (2006) have argued that polities of justification exist. They distinguish six: market, domestic, inspirational, industrial, fame, and civic strategies of justification. A related way to conceptualize systemic practices is suggested in institutional theory as institutional work practices (Lawrence and Suddaby 2006). Institutional work theory seeks to theorize how institutional structures (rules, norms, and perceptions) are maintained, changed, and disputed through engagement in institutional work. How actors can be empowered to voice interests in processes of innovation is an important issue for research. From a practice-based perspective, engagements of actors at the systemic level are not about flashing their self-interest but relating them to specific conventions for compromising, negotiating, justification, contracting, standardization, institutionalization, policy-making, and democratic interaction.

2.5 Practices of Human-Centric Innovation

Based on the above discussion of the three contexts of human-centric innovation (individual, group, and collective) and the three innovative practices (bricolage, system, and systemic approach), a typology of nine practices of human-centric innovation is tentatively laid out in Table 2.1. Such a table should indeed be treated with care and may be seen just as a sensitizing device for further explorative and explanatory research to identify human-centric practices. A potential practical implication of such an approach is that it can be used by managers to analyze an organization's activities of human-centric innovation, the who and what of human-centric innovation activities, and also what is missing.

Individual Human-Centric Innovation Practices First, bricolage practices may exist that engage individual users in co-solving their individual problems together with employees. We know from research that employees often solve problems on the spot in interaction with users. Some of this problem-solving activity may be delegated to the users themselves, for example, in primary care when a patient has to take care of her own disease. *Second*, system-oriented practices can exist in which individual users are actively engaged in co-development activities that lead to service innovation. For example, a patient discharged from a hospital can be asked to experiment with various bandages and plasters and provide feedback to a nurse about certain techniques that the nurse can then communicate to other nurses and patients. *Third*, systemic practices can exist that involve individual users in deliberations about service standards. For example, the Internet includes services like TripAdvisor that give users opportunities to give their opinion about services in a public context.

Table 2.1 Innovative practices of human-centric innovation

Innovative practices / Human-centric innovation contexts	Bricolage approach	System approach	Systemic approach
Individual h-c innovation	Practices that engage users in solving problems on the spot with the resources at hand	Practices that engage users in strategizing about how services can be delivered	Practices that engage individual users in disputes about the standards of services offered for users – and empowers users
Group h-c innovation	Practices that engage several users in solving problems of a specific service on the go for the benefit of the group	Practices that engage groups of users in co-production and co-planning with other stakeholders about the delivery of a specific service	Practices that engage users in the development of common standards for services offered for them and to make them fit with other practices
Collective h-c innovation	Practices to recognize the voice of users and make use of it to change the service portfolio for the benefit of a community	Practices that empower the users by giving them instruments for voicing their opinion vis-à-vis authorities and other stakeholders for the benefit of a community	Practices that engage service providers in agonistic development strategies for the common good

Group Human-centric Innovation Practices First, bricolage practices exist that engage groups of users in solving problems on the go. For example, users can be involved in user boards where they comment on daily activities related to a service offer, such as a school or a kindergarten. *Second*, system practices can exist where user groups in collaboration with other stakeholders are involved in the co-development and co-planning of a service, for example, if a new type of meal is to be developed for a particular school (Palumbo et al. 2018). *Third*, systemic practices can exist which make it possible to involve users in coordinating a particular service with other activities. In experience services such as sports, we find user organizations that influence how a service is organized, such as school work, so as to fit in with leisure or sports activities or parents' practices.

Collective Human-centric Innovation Practices First, bricolage approaches may be found where service providers respond to voices in the community, for example, the wishes expressed by a group of people who want to preserve and develop a supermarket and other services in a local area threatened with closure. *Second*, system approaches may exist, for example, if service providers create alliances with and empower users and citizens to express their opinions and put pressure on authorities or other stakeholders to change priorities and strategies for the common good in the local area. *Third*, systemic practices exist that involve service providers

with community actors in developing a community for the common good. This can, for example, be local companies, including hotels and restaurants, that participate in a new local tourism project, or so-called work integration social enterprises that provide labor for special groups.

2.6 Case Example

Below one case example of human-centric innovation in public services is provided to explore the above practice-based model in a practice context. The case is not a full case study but used here as an example of how human-centric innovation can be viewed and analyzed from a practice-based perspective.

2.6.1 Changing Elderly Care to Respond to User Needs

The case study concerns an experiment with social activities in areas with many elderly citizens in the Municipality of Copenhagen. It can be counted as human-centric innovation because it aimed to co-innovate services in the context of co-production and service delivery. The project comprised "the active involvement of end-users in various stages of the production process" as a condition for innovation (Voorberg et al. 2015).

The experiment was conducted by the Health Care Administration of the municipality in 2015–2016 as one of two experiments. The experiment is analysed for a different theoretical purpose in Fuglsang and Møller (forthcoming) (some information and analysis of the other experiment can be found in Fuglsang 2018). Some project activities were prolonged until 2018. Both experiments were closely followed by three researchers over a period of 2 years: Anne Vorre Hansen, Luise Li Langergaard, and the author of this chapter. The methods applied were interviews, observations, document analysis, and attending meetings with employees, civil society actors, and managers involved in the experiment. Interviews were carried out with employees, managers, and project members and focused actors' understandings of aims, processes, and ideas behind the development of co-production/co-innovation activities. The interviewees were employees, managers, and project members who had a key role in the projects, and they were selected due to their knowledge of and experience with the project. The material is comprised of ten individual interviews with project members and managers, two group interviews with project members and managers, one group interview with citizens, observation of two learning workshops in the project, six project meetings, two activities with citizens, six meetings with the project team in the municipality/local administration, and observation of two events at two different local areas. The researchers attended a conference together with a delegation from the municipality. Interviews were audio-recorded and fully or partly transcribed. Interviews and notes taken from participant observation were thematically analyzed.

One main purpose of the initiative was to counteract loneliness and increase the quality of life among elderly who were observed sometimes to be alone in their apartment for long periods of time. The experiment was seen as part of a paradigm shift in the municipality (Københavns Kommune 2015) toward increasing the quality of life for the elderly and increasing the service mindedness of the municipality. In brief, it was about human-centric service development due to its focus on involving end-users/citizens in service innovation.

2.6.1.1 The Bricolage Approach

The bricolage approach appeared present throughout the whole project. Through various activities, like bingo or parties with music, singing and dancing, or eating together, the project employees tried to attract residents in the area to come together. Employees were engaged in solving residents' problems on the spot together with residents in response to their experiences and perceptions of needs. Furthermore, part of the work was delegated to residents. For example, some residents had physical problems in attending activities; these problems had to be solved together with other residents. Residents could help each other. Not all were equally friendly toward each other which could cause problems that had to be dealt with. Rules of communication had to be co-produced and applied by the citizens. Residents also donated material resources on the go. One donated a grill that then had to be shared and installed. A men's group was organized and they were doing carpentry for other residents. The men volunteered to do small repair jobs for their neighbors. Great efforts were made on part of the project employees to really familiarize themselves with the residents and develop social relations with them through common activities, thus being able to talk with, understand, and respond to specific needs on the go.

2.6.1.2 The System Approach

Developing system-oriented practices of human-centric innovation in the residential areas appeared more complicated. In one of the experiments, a system approach was attempted right from the beginning focusing on the codification of almost every aspect of collaboration as well as the concept of loneliness. But it was criticized by employees and residents as being "just talk" and waste of time. A more action-oriented approach was consequently taken, where employees started to recruit residents and organize activities on the go that were found relevant. While employees were generally good at interpreting residents' needs, strategizing the knowledge that came out of these relationships turned out to be more difficult. This was, among other factors, due to the stress caused by the many different problems of relationship building they had to deal with, such as residents not attending activities or being unfriendly toward one another. Most of the activities offered were one-way services where the elderly only played a minor role in co-organizing, co-producing, and

co-planning the activity. As a result, the project was more about responding to residents' needs than co-innovating activities with them. Some attempts of collective co-innovation were made. For example, residents attended a meeting where they could come up with proposals for activities. One suggestion was organizing a telephone chain among themselves which would be useful when someone was sick or died. Practices existed in the neighborhood for speaking up and telling stories. However, these practices conflicted and did not often harmonize with the project goals. Strategizing such practices, in which input or criticism from residents were used in a strategic way, was difficult due to such conflicts, even if there were some exceptions. For example, the elderly men's club was a forum for discussion of what could be done in the local area. The men wanted to provide a digital newsletter for the residents. However, another co-produced activity to cook together with residents 1 day every week had to be given up because very few wanted to attend. Instead people preferred to attend communal eating that was entirely prepared and served by the project employees.

2.6.1.3 The Systemic Approach

Residents were meant to become more engaged in debates about the standards of services offered for them, along with other stakeholders. However, while meetings were organized, they tended to be organized on the premises of the project rather than emerging out of interactions among people in the area – and they were therefore dominated by the personnel. Yet, while residents were not involved in strategy making, they did actually participate in antagonistic discussions about the project and its role in the neighborhood. Yet, these deliberations were rather spontaneous on the street or in individual interactions between employees and users and in smaller groups. These antagonisms were often causing stress among employees and seen as barriers to implementing the project activities. Much work was put into inviting and transporting elderly to the activities offered, and convincing them to use them, rather than developing a culture of deliberation and democratic dialogue. The initiative of the elderly men to develop a digital newsletter was not supported by the project. The various activities that were organized remained fragmented and disintegrated. While they did contribute to local area integration and relationship building, the residents were still more "passengers" in these activities than they co-developed them from their own interests and experiences.

2.6.1.4 Summary of This Case

It seemed as if human-centric innovation did happen in the case. The project responded to user needs and experiences throughout the project and co-developed new user roles. Seen through the lens of a practice-based perspective, the bricolage approach seemed to play an important role in this. Problems were solved on the go with resources at hand. It appeared difficult to develop practices that focused on

system and systemic practices. However, the project as a whole did reflect practices at this level or attempts to establish such practices. However, the residents in the area were not all willing to or physically or mentally capable of participating in such activities. Their everyday practices were organized in ways which did not always fit well with the experiment of being an active citizen in a local residential area. For example, some had been very active during their working lives and preferred not to continue with high levels of social activity in this project – but to scale down and develop relations with friends and family outside the area. Others liked to live alone in their apartments and did not want to participate in sociability and festivities activities.

2.7 Discussion and Conclusion

A practice-based approach of human-centric innovation helps us to specify real practices of human-centric innovation. A practice-based approach recognizes the messy reality of everyday life and the difficulties in controlling the knowledge required for the innovation process. Innovation is not a ready-made entity from the beginning, or a specific procedure, but an accomplishment in an interactive setting. Human-centric innovation is thus a way of thinking, doing, and knowing that exist in real-life situations and may be further cultivated. A practice-based approach would seek to capture both structured and non-structured processes of innovation at different levels as they unfold in practice. What is suggested is a nonnormative, non-idealistic innovation-as-practice approach that identifies practices of human-centric innovation.

It has been attempted to outline and identify several practices of human-centric innovation – oriented toward taking end-users' needs, experiences, and knowledge as sources of innovation. The *practicing* of these practices is a central concern in this kind of analysis. Research must identify how and where such practices are practiced. In this sense, research should not only collect knowledge about the methods of human-centric innovation but especially about how these methods are practiced in real-life settings. The chapter has tentatively distinguished nine such practices and has briefly explored these practices in a case context of a social experiment. It was demonstrated that the practicing of some of these practices were difficult in the real-life setting of the experiment. Human-centric innovation is not merely dependent of practices within an organization but also of users' practices. This presents special challenges.

The nine practices outlined may fit with different types of situations. For example, a bricolage approach emphasizing individual human-centric innovation can be relevant in situations where resources are constrained and when users are not willing to enter into more elaborate innovation processes. A collective, systemic approach may be relevant if there is a high level of engagement in the community to develop common strategies of innovation, for example, in a territorial area such as an urban

area. Mangers and policy-makers can evaluate which types of practices are feasible and can be realized, cultivated, and combined.

Practice-based research may seem discouraging from a management perspective because practices are difficult to evaluate, control, and linearize through management. However, practices can be analyzed, articulated, embraced, and supported. Which practices that are realistic can be estimated. From a frontline employee perspective, a practice-based approach can be important because practice-based studies can help employees enrich the image of their work, for example, in relation to end-users (Nicolini 2009a). It can increase awareness of the valuable skills possessed by employees and users and articulate them vis-à-vis management. From a societal perspective, practice-based approaches can be critical for understanding the details of connecting and assembling practices that require coordination between multiple actors (Windrum 2013).

The study shows that there can be barriers to human-centric services related to the interaction with end-users. However, research could also investigate barriers related to policy-making and management. Taking the time to delve into the knowledge and learning required for human-centric innovation to take place, allowing users' experiences, co-planning, and co-decision-making to play a role for innovation, may lead away from mainstream policies and concerns. It can entail new inequalities if it appeals mostly to resourceful end-users. Stressing practices rather than organizational control may be challenging from a management point of view. Consequently, it will be important in future research to understand, articulate, and even measure the impact of human-centric practices, for example, by focusing and measuring their contribution to innovation and public value creation, but also to understand how other practices of innovation at the policy and managerial level may collide with human-centric innovation.

In summary, the contribution of this chapter was to articulate a practice-based approach to human-centric innovation and a sensitizing device for studying managing practices of human-centric innovation. A key finding is that the practice-based approach to human-centric innovation adds new insights to human-centric innovation. It raises questions of innovation and user involvement as a mundane activity, and it gives attention to everyday practices of bricolage, planning, strategizing, and democratizing innovation, thereby seeking to more effectively link human-centric innovation to a concept of everyday practice.

There are several limitations of the present study. First, it is mostly a conceptual approach that needs further validation through empirical research. Second, it could be extended with a wider approach of innovation-as-practice that identifies more generally the practices of innovation that can be found in (public) service organizations. Empirically the framework was stated in the context of a single case study. Consequently, the specific findings of that case cannot be generalized beyond this case study.

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Chapter 3
Systems Perspectives on the Interaction Between Human and Technological Resources

Marja Toivonen and Kyoichi Kijima

Abstract Along with the development of digitalization, it has become apparent that focusing on technology is not enough, but the crucial issue is how to link together technological and human resources. Systems thinking is needed to understand the interdependencies resulting from these linkages at different levels: in activity systems at the micro-level, in networks and ecosystems at the meso-level, and in the institutional setup that supports and regulates the development at the macro-level. In this chapter, we analyze these interdependencies in more detail. As a starting point for these analyses, we point out basic principles of systems thinking and present central benefits of the application of this thinking. We also consider the highly dynamic nature of the development of digitalization: we examine how the systems perspective can be applied in the conditions of change. A central message throughout is the view that the value of a specific resource depends on its relation to other resources.

Keywords Digitalization · Human resources · Activity systems · Networks · Ecosystems · Societal regulation

3.1 Introduction

Since the end of the 1980s, information and communication technologies (ICT) have been a prominent technology driving the development of the modern economy. During the first "wave" of the ICT breakthrough, there was already a lively discussion among academic scholars and policy-makers about the nature of the ongoing

M. Toivonen (✉)
University of Helsinki, Helsinki, Finland
e-mail: marja.toivonen-noro@helsinki.fi

K. Kijima
Daito Bunka University, Itabashi, Tokyo, Japan
e-mail: kijima@ic.daito.ac.jp

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change. A central issue in this discussion was whether the development should be analyzed primarily in terms of technological innovation or whether the human and social aspects of ICT should also be in the spotlight.

"A technologist view" dominated the early discussion (Gallouj 2002), but there were champions who advocated a broader perspective. They highlighted that in the adoption of technological novelties, human activities play an important role: novelties are reinvented in use, they are supplemented with context-specific meanings, and the related social relationships are restructured (Tuomi 2002). Reinvention is due to the fact that new technologies are not completed and unchangeable artifacts, but very often need modifications. They are also actively interpreted and appropriated by the users and have different meanings for different user groups. Furthermore, social practices change together with the incorporation of new technologies (ibid.).

The discussion between the proponents of the "technologist view" and the representatives of the broader perspective was crystallized in the main scholarly concept that was applied to characterize the new ICT era. The concept of "information economy (or information society)," which was first adopted, focused on the new ways to handle, compile, transfer, and store information. It was soon supplemented or even replaced with the concept "knowledge economy (or knowledge society)" (Antonelli 1998; Lundvall 1992). While appreciating information infrastructures as a necessary precondition, the proponents of this concept emphasized that knowledge is more than information: its core contents are interpretation and application. Along with the advancements of ICT, the real issue is how to find the essentials, i.e., how, where, and when to dip into information flows. Need for competences linked with locating and selecting contextually relevant information and using it in efficient ways notably grows (ibid.).

The rise of the Internet in the 1990s and at the beginning of the new millennium induced again a new emphasis in the main concept used to summarize the most important megatrends in society. The rapid rate of change was brought to the fore and was argued to require capability to produce new knowledge continuously and quickly. Thus, the process of learning was highlighted instead of the stock of knowledge, i.e., the knowledge possessed by agents and organizations at a certain point of time. The concept of "learning economy (or learning society)" was suggested as a concept that best captures the novel aspects in the societal development (Lundvall 1999). The importance of practical forms of learning – "learning-by-doing" and "learning-by-using" – was pointed out besides conscious search. Correspondingly, "knowing-how," based on practical skills, was considered as necessary as knowledge of facts and reasons ("knowing-what" and "knowing-why") (Lundvall and Johnson 1994).

"Learning-by-interacting" was identified as a new form of learning that specifically characterizes the Internet era (Johnson 1992; Lundvall 1992). It refers to "a network economy (or network society)" (Castells 1996) – the fourth concept that was adopted to describe the essentials of the ongoing societal development. Here, the basic idea is that knowing how to do things in isolation is not the decisive type of knowledge anymore. The creation of new knowledge in the Internet era is a collective undertaking that involves a number of actors with different skills and competences (Kash and Rycroft 1994). ICT provides an important infrastructure for

networking practices, but these practices do not develop on the basis of technology only. New insights concerning collaborative models are crucial and function as a further incentive to improvements of technology (Castells 1996). To point out the specificities of knowledge needed in interactive processes and cooperation, researchers have suggested additional types of knowledge: "knowing-who," "knowing-when," and "knowing-where" (Lundvall and Johnson 1994).

The broad view of technology is even more topical today when digitalization means a deeper change than the earlier advancements of ICT. The current development includes factors that easily lead to technological bias if attention is not payed to the human and social aspects and impacts. Along with the new digital systems, automation, and robotics, the replacement of some intellectual activities has become a reality. An especially noteworthy phenomenon in the new phase of the Internet economy is the interaction of digital equipment without human interference. The accumulation of data is no longer limited to human creation, but different devices and sensors collect, store, and transfer data automatically, reflecting the phenomenon of the "Internet of things" (Haller et al. 2009). The concept of "big data" refers to the huge mass of data emerging in this way. Consequently, there are increasing amount of data, increasing speed of data transfer, and increasing variety of data sources (Boyd and Crawford 2012; Gunther et al. 2017). A major increase in dynamism is a fundamental constant in our world – the new normality of and in organizations (Farjoun 2010).

Digitalization is today an essential part of all kinds of social and economic activities and the everyday life of citizens. However, the related new opportunities will not be realized without human activities: interpretation is still a necessity and is linked to the contextual nature of relevant knowledge. Digitalization does not make human activities less important but highlights a broad, knowledge-based view on technology and new ways of human-technology interaction (Wieland et al. 2016). Digitalization means not only automation but also networking, mobility, socio-structural shifts, and globalization (Stein 2015). It is an opportunity because of novel solutions to various problems, but it is also a threat because novelties mean uncertainty. These uncertainties are strengthened by the systemic features of human and social activities: the abundance of interconnected elements and feedback loops, the unexpected nonlinear behavior, non-transparent cause-effect relationships, and unpredictable side effects and secondary effects (ibid.).

In this chapter, we discuss the human and social side of digitalization in more detail, taking a systemic view as our starting point. First, we point out basic principles of systems thinking and present some central benefits of the application of this thinking. Thereafter, we examine systemic interdependencies and digitalization at different levels: human-technology interaction in activity systems at the micro-level, networks and ecosystems at the meso-level, and the institutional setup that regulates the development at the macro-level. In addition to the emphasis on systems thinking, we highlight the role of resource integration: the idea that the value of a specific resource depends on the context: on its relation to other resources (Vargo and Lusch 2011). Before concluding remarks, we examine how the systems perspective can be applied in the conditions of change. In this way, we take into account the highly dynamic nature of the development of digitalization.

3.2 Principles and Benefits of Systems Thinking

Now we introduce basic principles of systems thinking and illustrate why it is relevant to adopt systems thinking to investigate interaction between humans and technological resources. According to a standard dictionary, a system is defined as "a set or an arrangement of elements so related or connected as to form a unity or organic whole" (Webster's New World Dictionary). Though different dictionaries may contain different variations of this particular formulation, this definition captures the essence of a system and is helpful to provide a starting point to arguing the idea of systems thinking.

Systems thinking is a holistic approach for describing and understanding systems, predicting their behaviors, and devising modifications to them in order to produce desired effects by focusing on their systemic properties or "systemicity." It contrasts with reductionist approach, which studies objects by breaking them down into their separate elements. We can apply systems thinking, in principle, not only to social science but also to a wide range of other disciplines including medical, environmental, political, economic, and engineering studies.

Systems thinking, among others, tries to figure out how a system's elements/parts interrelate each other and how systems work over time and within the context of larger systems. Indeed, interaction between parts is the key systemic property that systems thinking focuses on. Interaction among parts is assumed at least as important as the parts themselves: the fact that systems scientists call interaction and elements/parts *systemhood* and *thinghood*, respectively (Klir 2001), clearly shows what importance they put on interaction.

Systems have behavior resulting from the interaction of element behaviors. The term "synergy" is used to describe the essentials of the well-known idea that "the whole is greater than the sum of the parts." It is also possible to have "negative synergy" where the whole is less than the sum of the parts.

It might be appropriate to identify a system as *complex* if it contains a sufficient number of elements and if these elements are heavily interconnected with each other. Complexity frequently takes the form of hierarchies (Simon 1962). Hierarchical systems have some common properties independent of their specific content, and they will evolve far more quickly than nonhierarchical systems of comparable size (Simon 1996). The term "emergence" refers to behaviors generated across hierarchies of a complex system.

System's dynamic mechanism, which systems thinking is interested in, is explained in terms of feedback mechanism. Feedback is classified into two types. Negative feedback is for maintaining the system state against a set of objectives or levels, while positive feedback forces growth or contraction to new levels. One of the main issues here is the balance between stability and speed of response. Negative feedback is essential for adaptation of the system; by adaptive transition a system tries to change itself or its environment to achieve stability. Positive feedback is taken as a source of evolution and phase transition.

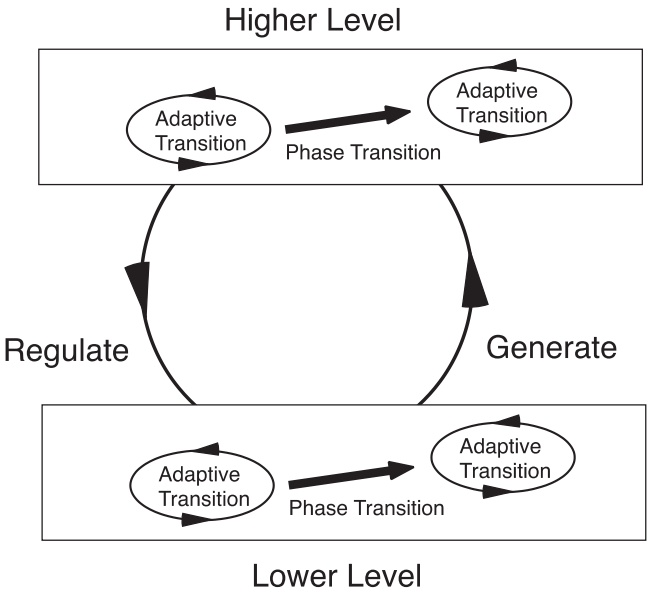

Fig. 3.1 Micro-macro loop

By adopting systems thinking, we can highlight such systemic properties of socio-technical systems as interaction, complexity, hierarchy, and feedback mechanism when investigating interaction between human and technological resources.

A socio-technical system is obviously an extremely complex system where various elements including human and technological resources interrelate with each other. It forms control hierarchies. Systems within a hierarchy of society show adaptive transitions as well as phase transitions (Kijima et al. 2016) (see Fig. 3.1). Systems at a higher level have some ownership of control and regulation over those at lower levels to form "preferred patterns" which can be used to the enhanced stability of interacting systems hierarchies (Hitchins 2009). At the same time, systems at lower levels generate system's patterns at higher levels. This kind of regulation and generation across the levels is called "micro-macro loop." It is useful to employ the micro-macro loop as a "unit component" in a recursive way for analyzing practice of interaction between human and technological resources.

3.3 Digitalization as a Driver for Interaction Between Human and Technological Resources

As noted in the introduction, digitalization influences human activities in multiple ways. These influences can be examined both as general trends and as specific changes in different social spheres and economic sectors. In the following, we

combine these approaches: we present some general frameworks and models to analyze the impacts of digitalization at various levels and examine developments going on in private life, workplaces, and various societal sectors (health care, education, etc.).

3.3.1 Human-Technology Interaction and the Concept of Activity System

Digitalization effects on the role of the technology user in various physical environments and social conditions. Its impacts have often been argued to be emancipatory, increasing the autonomy and freedom of users. On the other hand, the use of digital technologies requires many kinds of capabilities: online reactions, rapid learning, and flexibility in relation to continuous change. These capabilities are linked to ICT literacy – the ability to access, analyze, and produce communication in a variety of digital forms – which is not self-evident among different user groups (Tyner 2014). Consequently, concern about digital divide, i.e., unequal access and usage of the digital sphere, has been expressed. It is seen to prevent the full realization of the democratizing tendency enabled by digitalization (Ragnedda and Muschert 2013). Along with the spread of Internet, the focus of the discussion about inequalities has moved from the mere "have not" issue to the lack of digital proficiencies that creates "second level digital divide" (van Dijk 2013).

A central feature of the current digital era is marketizing. Permeating digital technologies engages increasing numbers of children, young people, and adults as consumers. There is a pressure on people of all ages to make sense of and choices about how to navigate the complex possibilities facing them. Connectivity around the clock, with a parallel existence in virtual space, is seamlessly integrated with actual lives. People have to be skillful collaborators, navigating digital spheres with ease, being capable to generate and manipulate various contents, creating social networks, and experimenting virtually with versions of their "social face" (Craft 2012). The strengthening role as consumers has aroused critique toward the digital revolution in the case of children and youth, in particular. There are two competing discourses: young people are seen as vulnerable and at risk; or they are described as capable and potent. The latter view embraces digitalization as exciting and enabling – fostering co-creation that nurtures plurality, participation, and possibilities (Livingstone et al. 2011).

The blurring of the distinction between reality and virtuality characterizes working life, too. In this context, an important characteristic is also the blurring of the distinction between human and machine (Floridi 2015). Factory objects are increasingly equipped with integrated processing and communication capabilities: various sensors, software, and network connectivity opportunities enable machine-to-machine (M2M) communication. As machines, equipment, and component parts become autonomous and self-organizing, they become an active part of business

processes (Brettel et al. 2014). This development has far-reaching consequences for the interplay of humans and technology in terms of control, for instance. Both problems and demands in the factory space will change, and even very complex manufacturing scenarios become manageable. In contrast to the earlier approaches (especially those in the 1980s), the current evolvement of digitalization is not gravitating toward workerless production facilities. On the contrary, the aim is to integrate employees into the production structure in such a way that their individual skills and talents can be fully realized (Gorecky et al. 2014).

The nature of work is radically changing also in the services provided for the welfare of citizens. Health care, in particular, is an area that has experienced a considerable transformation as a result of digitalization. A central element is a change in the roles of patients and professionals: patients are encouraged to take up new digital technologies to carry out self-monitoring and self-care. This patient engagement is usually fostered as part of the so-called integrated care programs whose purpose is to streamline care processes, improve the access to services, and diminish financial problems that characterize the health sector in most developed countries. In addition to active utilization of digital options, these programs include patient support and education, structured clinical follow-up and case management, and multidisciplinary care teams (O'Connor et al. 2016). While the aims are reasonable, the transformation is not always welcomed by patients; the burden of self-care provokes emotions and resistances. It is also possible that the digital solutions do not substantially diminish the total workload of professionals because digitalization multiplies the amount of data and consequently increases "invisible work" linked to handling of this data (Lupton 2013).

Learning is a core topic in the discussion on digitalization. Several concepts have been adopted to capture the new forms of learning: the concepts of e-learning, mobile learning, and ubiquitous learning describe the broadening scope of opportunities (Siemens 2014). Human-technology relationship in the digital context has also evoked multiple theoretical analyses, ranging from the application of the classical learning theories (e.g., Dewey 1938) to new approaches (e.g., the theory of connectivism suggested by Siemens 2014).

One popular approach is activity theory. Its core is the concept of *activity system*, defined as an interrelated set of elements, including individuals, objects, community, tools, rules, and division of labor (Engeström 1987, 2016). Activity refers to an interaction of the individual (subject) with objects; community constitutes a third node in the system. Three means mediate the contents of activity: tools for the subject-object interaction, rules for the subject-community interaction, and a division of labor for the community-object interaction. Thus, activity is systemic in nature, spanning an individual action and the collective interaction. Activity results in transformation of the object and of the knowledge and skills of the subject. Tools both constrain and support the learners in this transformation. Applied to the present framework (see Fig. 3.2), digital tools facilitate the user to access information via human-technology interaction in a specific technological and community context that includes specific communication channels and protocols (Sharples et al. 2007).

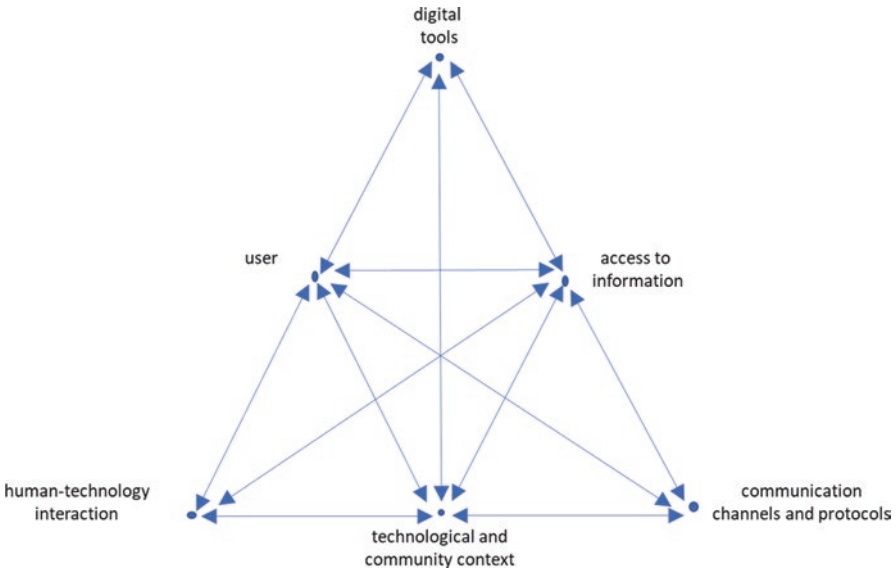

Fig. 3.2 Activity system in the digital context. (Modified from Sharples et al. 2007)

In activity theory, learning is seen to be a collective, transformative process that takes place within an activity system that evolves over lengthy periods of socio-historical time (Engeström 1987, 2016). Digitalization means a shift from the primacy of stand-alone things and properties to the primacy of processes and interactions (Floridi 2015). This characteristic of digitalization is well captured by activity theory, in which systems thinking and the idea of the integration of various resources are central (Mele and Russo-Spena 2018). Even though this theory is a learning theory in the first place, it also enables a more general analysis of the micro-level interactions between human beings and technology.

3.3.2 Interaction in Networks and Ecosystems

A central consequence of digitalization is the growing importance of networking. During the first "wave" of the ICT breakthrough, "a network economy" was already suggested as a concept that characterized the new era. Castells (1996) argued that the advancement of ICT fosters the emergence of a networked enterprise as the organizational form that answers the challenge of increasingly uncertain and unpredictable environments. According to him, a strength of networks lies in the shift from vertical bureaucracies to horizontal cooperation enabled by the use of ICT that connects dispersed organizational nodes. Individual members are dependent on the entirety, but they are also independent because they can be part of several other networks. An important aspect of networking is its relationship to innovation: a

network organization combines the advantages of a bureaucratic organization with a structure that supports innovation (ibid.).

More recent discussion has supplemented these views, aiming at a better understanding of the continuous interaction and behavior of interconnected organizations (Ghisi and Martinelli 2006). Business networks are a network type that has aroused notable interest. Researchers have emphasized that digital technologies are fundamentally transforming business strategies, business processes, firms' capabilities, products and services, and key interfirm relationships (Bharadwaj et al. 2013). The paradigm of atomistic actors competing against each other in an impersonal marketplace is becoming less adequate in a world in which firms are embedded in networks of social, professional, and exchange relationships with other economic actors (Gulati et al 2000). As economic activity is changing from stand-alone to interconnected economic agents, there are increasingly not only networks of organizations but also network organizations. They are characterized by reciprocal and stable interorganizational ties, which are strategically important to participating firms. Multiplicity and density of ties are typical in a strategic network organization (ibid.).

In addition to collaboration between companies and organizations, digitalization fosters collaboration between organizations and consumers (Bharadwaj et al. 2013). An example is crowdsourcing, which is a collaboration model enabled by people-centric web technologies to solve individual, organizational, and societal problems using a dynamically formed crowd of interested people who respond to an open call for participation (Pedersen et al. 2013). The emergence of the Internet and social media has significantly lowered the cost of involving masses of digitally connected consumers via virtual platforms. Crowdsourcing provides a grassroots perspective on how technological facilitation alters the realm of collective innovation: social interactions trigger new interpretations and new discoveries that individual actors' thinking alone could not have generated (Hargadon and Bechky 2006).

An important step in the study on networks has been the introduction of the concept of *ecosystem* (Iansiti and Levien 2004). This concept provides a way to enrich the analysis of networks by considering the organization as an interconnected part of its larger environment and by emphasizing both the role of the individual organization and the collective "health" of the system (ibid.). A crucial aspect that the concept of ecosystem brings to the study on networks is self-adjustment. Ecosystems are not just aggregations of relationships but dynamic systems that are simultaneously functioning and reconfiguring themselves. Technology and innovation drive system evolution and performance (Lusch et al. 2010).

While the concept of ecosystem has been welcomed as an inspiring concept, it has turned out to be difficult to specify the differences between networks and ecosystems. Some researchers have noted that it is most interesting and useful to use the business ecosystem concept as a perspective to understand business networks, rather than as a new organizational form (Anggraeni et al. 2007). In addition, supplementing the views on business networks and ecosystems with other theories has been considered important. Social network theory and complex adaptive systems theory have been suggested as idea sources, in particular (ibid.).

Social network theory is of old origin: its first antecedents can be traced back to the 1940s, and it is recognized as a coherent theory since the 1970s. Central topics of inquiry have been the quality and quantity of relational ties, the structural position of individual actors in a network, and the overall network properties (e.g., density, centralization, and modularity). An important contribution of social network theory is its broad scope; it includes actors both inside and outside the business world and also takes into account actors with indirect roles. Attention is payed to industries producing complementary products, outsourcing companies, competitors, regulatory agencies, financial institutes, research institutes, media, and universities (Anggraeni et al. 2007). Social network theorists have also emphasized the versatility of the forms of networks and ecosystems. Besides strategic and stable forms, there are loosely coupled spatial and temporal structures and soft contracts. Weak interpersonal ties characterize this "loose coupling" and can play an important role in the diffusion of ideas and information (Granovetter 1973). With the ascendance of digitalization, spontaneity of sensing and responding increases and makes loose coupling all the more general (Lusch et al. 2010).

The theory on complex adaptive systems adds to the understanding of networks and ecosystems by emphasizing coevolutionary processes and nonlinear changes. A coevolution process develops between the networks of localized and trans-local knowledge based on digital information exchange. Networks gradually evolve from random collections of agents to more structured communities with a reciprocal structure. Adaptation and survival are the hallmarks of this process (Gundlach 2006). The network interacts and coevolves with its environment, which creates dynamics because there is feedback in terms of cooperation and competition. As complex systems, networks show nonlinear behavior, stemming from the interaction of loosely coupled agents. Small changes can lead to different future paths in the form of structures, patterns, and properties. In other words, the network structure and dynamics are emergent phenomena as a result of the self-organizing characteristics of a complex system, in which agents simultaneously and in parallel react on the changes (Choi et al. 2001).

A recent approach applying the views on complex adaptive systems is service-dominant logic (S-D logic) (Vargo and Lusch 2004, 2018). It has brought to the fore the role of value co-creation as a central economic activity. According to S-D logic, (use) value is always co-created between the producer and the beneficiary (user) via the integration of resources from different sources. The usefulness of any particular resource from one source is moderated by the availability of other resources from other sources, the removal of resistances to resource utilization, and the actors' ability to integrate them (Lusch et al. 2010). It is also important to note that value co-creation always takes place in a specific context, formed by a set of unique actors with unique reciprocal links among them. Complexity emerges because links between two actors affect other actors and links throughout the context and vice versa. Thus, it is possible that hundreds of actors and links constitute one specific context (Chandler and Vargo 2011). Further, the context is deeply social in nature: it is shaped by social forces and reproduced in social structures (Edvardsson et al. 2011).

3.3.3 Society-Level Issues of Digitalization

Besides the pervasive effects on human-technology interaction and organizational collaboration, digitalization transforms industry structures and contemporary society as a whole (Brynjolfsson and McAfee 2014). Parallel with the new micro-level practices in workplaces and everyday life, there emerge macro-level societal issues that call for policy actions to seize the new opportunities for wealth creation and to defend society against the possible threats. The issues included are multiple, and handling them in this context can be only exemplary. We point out three topics: the change of the nature of skills and employment, the concern on privacy and ethics, and the paradigmatic change in the public sector.

Digital technologies increasingly complement workers in complex problem-solving tasks while replacing humans performing rule-based manual labor. Recent developments suggest that even a wider range of jobs may become obsolete as pattern recognition capabilities are incorporated in robotic innovations (Brynjolfsson and McAfee 2014). On the other hand, researchers have noticed that, throughout history, technological advances have created more new jobs than they have displaced. The emergence of totally new occupations has been particularly important. It is often neglected in pessimistic scenarios that typically focus on changes in existing occupations. However, there is constant need to update the skill set of workers to keep up with the evolving division of tasks between machines and humans (Mokyr et al. 2015).

Privacy and control are another major area of policy concern. While protecting of sensitive information via anonymization, purpose limitation, individual rights, etc. has considerably developed, new threats have emerged due to the continuously increasing collection of data from day-to-day activities of people. Smart things allow for ubiquitous data gathering, and big data analytics can deal massive volumes of unstructured, structured, and semi-structured content (Soria-Comas and Domingo-Ferrer 2016). Social and ethical issues associated with the exploitation of digital technologies are highly topical, and thoughtful regulation of the use of these technologies is necessary. There is a tension between businesses and decision-makers – which increasingly profile customers and personalize products and services – and individuals, who are "walking data generators" but often unaware of how these data are being used and by whom and with what consequences (McAfee and Brynjolfsson 2012, 5).

In the public sector, digitalization both enables and requires a paradigmatic change toward citizen-centric operations. Whereas IT systems in the earlier stages mainly affected back-office processes, they now condition in important ways the whole terms of relations between government agencies and civil society (Dunleavy et al. 2006). The dominant forms of management – bureaucracy and market-imitating New Public Management (NPM) – have turned to be inefficient in this situation (Hartley 2005). In the ongoing renewals of the public sector, the aim is to create a radically less complex institutional landscape, engineered for simplicity and automaticity in routine operations and for agility and responsiveness in service

delivery and government's monitoring of the risk environment. Visibility of organizational operations both to the personnel and to citizens is highlighted, and reliance on citizens' own capabilities plays a central role. Fewer and broader public agencies are a typical organizational form; it is seen to support the goals of integrated and holistic governance (Dunleavy et al. 2006).

In the broad, society-level issues, the need for a systemic view is apparent. Here, a specific answer to a specific problem often causes the emergence of a new problem. The most fruitful model to tackle the complex bundle of problems is the simultaneous development of technologies, services, organizations, and multiple network and partner relationships (Kivisaari et al. 2013). In addition, it is important to take into account the context and environment in which the objects of development are embedded. Answering context-specific issues is often a strength in the renewal; on the other hand, context-specificity makes it difficult to disseminate the novel solution to other contexts (Moulaert et al. 2005).

The difficulty of dissemination is linked to the fact that systemic problems cannot be identified and tackled directly, but a dialogue is needed between the practical level, on which the problems are manifested as separate troubles, and the conceptual level, on which the linkages of problems can be discovered. Several constructs have been utilized to describe this dialogue. Windrum (2008) speaks about "conceptual innovations," referring to questioning the existing assumptions and knowledge that maintain current services, processes, and organizations. Suddaby and Greenwood (2005) use the term "theorization" to point out that linguistic devices help actors make the changes comprehensible. Maitlis and Christianson (2014) highlight sensemaking: positioning the change agent in the context and constructing a shared meaning of the change effort. Sense-making also plays a central role in resource mobilization, which is the next challenge after the basic solution to a systemic problem has been found. Cultural-historical activity theory – which we applied above to describe human-technology systems – starts from the embedded contradictions that can be identified in all social systems. These contradictions have developed during the system's historical development and have to be revealed before a solution can be found (Engeström and Sannino 2010).

In recent years, the social structures that promote or constrain the spread of new solutions and practices – usually including digital aspects – have aroused increasing interest. *Institutional theory* has been suggested as a promising framework in the analysis of this topic. Institutions can be defined as the cognitive, normative, and regulative structures and activities that provide stability and meaning to social behavior (Scott 1995). Institutions manifest themselves in many forms; they can be formal codified laws, informal social norms, conventions (conceptual and symbolic meanings), or any other routinized rubric that provides a shortcut to cognition, communication, and judgment. In practice, they typically exist as part of more comprehensive institutional arrangements – interdependent sets of institutions (Thornton et al. 2012). The process of institutionalization is essential for both the creation and dissemination of novelties and includes the change and disruption of institutions. It is important to point out that it also includes the maintenance of some parts of older

arrangements and behaviors: even innovations that represent major institutional shifts are built upon existing institutions (Wieland et al. 2016).

3.4 Digitalization and Systemic Change

3.4.1 Cross-Level Interaction of Human and Technological Resources

Digitalization drives not only adaptive transitions and phase transitions of interaction patterns between human and technological resources but also wider societal changes in beliefs, values, and governance that coevolve with technological changes. In order to analyze digitalization in the context of interaction between human and technological resources with wider societal changes, transition management theory (TMT), a basic systemic framework proposed especially for discussing societal sustainability (Kemp et al. 2009), works as a useful framework for our investigation.

As observed in the previous sections, digitalization drives simultaneous and cross-level development of organizations, technologies, services, and multiple networks and ecosystems. TMT identifies three levels in a society, namely, micro-, meso-, and macro-levels. Based on a multilevel model of social innovations TMT proposes (Kemp et al. 2009), we develop a unified model describing adaptive and phase transitions within a level as well as cross-level generation-regulation processes in a society (Fig. 3.3) (Kijima et al. 2016; Toivonen and Kijima 2018). This model illustrates how within-level and cross-level interactions of human and technological resources are related and how the interactions go on dynamically. Behind the process of social change, multiple and interrelated phenomena take place at different speed and level (Rotmans and Loorbach 2009).

At the lowest level, which is called micro- or "niche" level by TMT, novelties are created, tested, and diffused. Such novelties can be new technologies, new rules and legislation, new organizations, or even new projects, concepts, or ideas. At this level, a combined process of adaptation (adaptive transitions) and a structural change from one relatively stable system to another (phase transitions) takes place (Kijima et al. 2016; Toivonen and Kijima 2018).

The second and middle level is the meso-level at which what we call "regime" is located. The term "regime" refers to the dominant culture, lifestyle, brand, market, and physical and immaterial infrastructures. These institutionalized structures give stability to the lower level and guide decision-making and individual behavior of actors. At the same time, the regime has a certain level of rigidity that normally prevents innovations from changing the structure fundamentally.

Generally faster and smaller adaptive/phase transitions at the lower level generate an impact on slower and larger adaptive/phase transitions at the higher level. At the same time, slower and larger adaptive/phase transitions at the higher level regulate faster and smaller adaptive/phase transitions at the lower level (Squazzoni

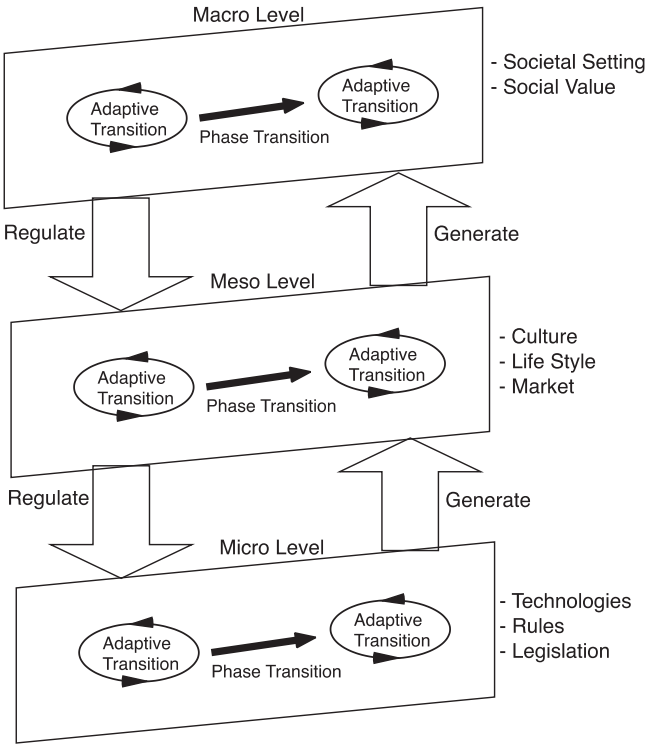

Fig. 3.3 Interaction of human and technological resources. (Modified from Kijima et al. 2016; Toivonen and Kijima 2018)

2008). Applying these arguments, we can conclude that social needs and demands at the meso-level trigger technological innovations and phase transitions at the niche level, while, at the same time, new technologies create and lead to new lifestyles and social cultures. On this aspect, we can identify cross-level coevolution among markets, networks, institutions, technologies, policies, individual behaviors, and autonomous trends (Djalante and Djalante 2012).

The highest level is the macro-level or "landscape," where the overall societal setting is formed. The landscape consists of social values, belief, economic environments, and trends in a wider sense. The landscape level regulates adaptive/phase transitions at the niche and regime levels by defining the room and direction for change. At the same time, the regime and niche levels generate adaptive/phase transitions at the landscape level.

3.4.2 *Digital Transformation: Interactions of Human and Technological Resources*

Digital transformation or DX is a societal change in which digital technology integrates all areas of business and even brings about changes in lifestyle. Though the definition is not rigid, digital transformation not only triggers adaptive and phase transitions but also makes cross-level changes that continually challenge the status quo of the society as a whole.

Bottom-up or generative activities constitute an "engine of digital transformation." The creation and implementation of digital transformation highlight empowerment: citizens are not passive recipients, but active co-developers (Harrison et al. 2010). On the other hand, top-down or regulative activities are also necessary for the materialization and dissemination of social innovations. Decision-makers and managers have to support and organize bottom-up processes in order to make ideas implementable and scalable (Høyrup 2010).

For example, the Japanese government facing very serious aging society problem is keen to implement work style reform by inviting ex-working women and senior people back to the office employing telework systems in particular. At the same time, advancements in robotics and AI technologies gradually change people's mindset. Indeed, quite a few people now consider seriously about work-life balance from a different viewpoint, and traditional seniority systems are fading out.

The framework of hype cycle developed by Gartner (2018), which tries to capture graphically the dynamics of how the development of new technologies generates expectations from business and market, aims to illustrate such cross-level generation/regulation interactions. According to it, a technology's life cycle goes through five key phases (Fig. 3.4), and at each phase the market generates different degree of expectations to it (Gartner 2018). The phases are as follows.

At the "Innovation Trigger" phase, a potential technology breakthrough kicks things off, but often non-usable products exist, and commercial viability is unproven. At the "Peak of Inflated Expectations" phase, early publicity produces a number of success stories, but often they are accompanied by scores of failures. At the "Trough of Disillusionment" phase, producers of the technology shake out or fail. Investments

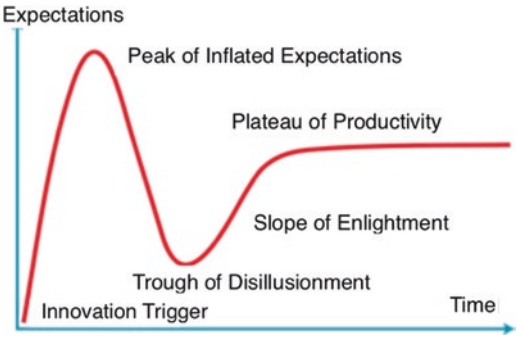

Fig. 3.4 Hype cycle. (Gartner 2018)

continue only if the surviving providers improve their products to the satisfaction of early adopters. At the "Slope of Enlightenment" phase, the way how the technology can benefit the enterprise becomes more widely understood. Second- and third-generation products appear from technology providers. At the "Plateau of Productivity" phase, the mainstream adoption starts to take off, and the technology's broad market applicability and relevance are clearly paying off.

The trajectory clearly shows a *dynamic* cyclic relationship between technology and expectations. Through the stages, technologies push societal expectations, and, then, higher expectations pull new technologies. When this push-pull cycle takes a pattern of positive feedback, it leads to technological breakthrough as well as drastic societal change. These arguments suggest that "technologies in season" is essential for such positive feedback.

3.5 Concluding Remarks

In this chapter, we have analyzed the change from the early days of ICT development to the present situation, in which digitalization is an essential part of all kinds of social and economic activities and of the everyday life of citizens. Digitalization causes pervasive effects on human-technology interaction and on socio-technical structures. It forces us to rethink the traditional definitions of economy, wealth creation, business organizations, and other institutional structures. Potential for many kinds of innovations is one of its important effects; it enables the adoption of new forms of learning and the development of various disciplines and professions.

However, the new opportunities will not be realized without human activities. In the early stages of ICT advancement, an important insight was the transfer from the analysis of mere technology to the emphasis of knowledge and learning. In the digital era, human interpretation is equally central because the relevance of knowledge is contextually defined. Further, the dependence of digitalization on human and societal activities is manifested in phenomena that require organizational and managerial solutions: networking, mobility, socio-cultural shifts, and globalization are phenomena tightly linked to digitalization.

An important message in this chapter is the systemic and dynamic nature of the interrelationships between technological and human resources. Understanding the present development requires a move of the focus from the analysis of stand-alone things and properties to the analysis of processes, interactions, and resource integration. Correspondingly, impactful innovations are more and more often systemic, influencing simultaneously on technologies, services, organizations, and partner relationships.

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Chapter 4
Human-Centered Co-evaluation Method as a Means for Sustainable Service Innovations

Kirsi Hyytinen, Eveliina Saari, and Mattias Elg

Abstract This chapter develops a human-centered co-evaluation method for the evaluation of service innovations in the context of digital services. The method derives from two different theoretical approaches. It integrates a multi-criteria evaluation framework to evaluate multiple impacts of innovations and a process of developmental evaluation to support multivoiced evaluation and continuous learning throughout their development process. The new method emphasizes human and societal impacts, which are analyzed parallel with the traditional techno-economic characteristics of innovations. It makes human-centeredness and sustainability more visible as values than traditional evaluations and thus guides the development toward more inclusive and ethical digitalization.

Keywords Evaluation · Developmental evaluation · Human and societal impact · Multivoiced learning · Evaluation capacity building · Service innovation · Digitalization

4.1 Introduction

The current transition into the digital era is radically changing the service context in our societies. The digital era revolutionizes traditional hierarchical and sector-specific service provision. To ensure the usability of the services, the systemic nature of innovation should be considered: in renewing the services, simultaneous

K. Hyytinen (✉)
VTT Technical Research Centre of Finland, Espoo, Finland
e-mail: kirsi.hyytinen@vtt.fi

E. Saari
Finnish Institute of Occupational Health, Helsinki, Finland
e-mail: eveliina.saari@ttl.fi

M. Elg
Linköping University, Linköping, Sweden
e-mail: mattias.elg@liu.se

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development of organizations, technologies, services, and multiple partner relationships takes place (Geels 2002, 2004; Kemp et al. 2009).

Public sector services aim at creating social value by improving the well-being of citizens (Kroeger and Weber 2014) and answering the target group's service needs. Their ultimate aim is not to gain profit but to create value to citizens (Hartley 2005; Lévesque 2013). In digital services, the roles of citizens and employees may change radically. More skills and agency may be required from citizens, and routine work of the service employees may diminish (e.g., Berger et al. 2016). Digitalization can be a great opportunity for those who have the knowledge and devices to use digital interfaces but simultaneously a threat to the disadvantaged citizens.

The perspective of social innovation improves understanding on the participatory and networked processes that are in the core of creation, implementation, and diffusion of such innovations (Harrisson et al. 2010; Harrisson 2012; Mulgan 2007; Moulaert et al. 2013). Social innovation highlights that the active engagement of various actors and collaboration between them are essential to generate broad society- and population-level impacts. A central reason is that learning in broader partnership and network structures has become a leading idea to deal with the complexities and uncertainties of development efforts (Bovaird 2007). A key mechanism is active engagement that promotes the process of achieving agreed-upon goals and values. Such structures may reach beyond the organization, and, on both democratic and pragmatic grounds, they may involve citizens in the design from the very start to realization in practice (Flyvbjerg et al. 2003). As a consequence, forms of evaluation need to address not only the summative effects but also the process-based, formative results that emerge as various actors engage in learning evaluation (Brulin and Svensson 2012).

Usually, evaluations tend to focus on single values of technological progress and cost efficiency. They ignore the broader societal effects and phenomena that are meaningful from the perspective of human beings: their health, lives, competences, motivation, and other existential aspects. This is because these impacts are not easily measurable (Dahlberg 2018). However, the techno-economic approach is too narrow to describe the ubiquitous, multifaceted, and interactive phenomena of digitalization and its impact on peoples' lives (Djellal and Gallouj 2013; Hyytinen 2017). Qualitative methods are needed to illuminate the multiple values in a fine-tuned way, e.g., impacts on people's sense of well-being or inequality. Furthermore, learning-oriented evaluation and dialogue between different perspectives, such as those of citizens and employees, are needed to make visible the consequences digitalization may have on peoples' everyday lives (Dahlberg 2018).

As the main aim of this chapter, we suggest a human-centered co-evaluation method, which focuses on multiple values of digital innovation and creates a process for mutual learning and capability building between inclusive actors. The developed method consists of (1) a multi-criteria framework which is used to evaluate multiple impacts of innovation (Djellal and Gallouj 2010, 2013; Hyytinen 2017) and (2) a participatory evaluation process to support multivoiced evaluation and learning (Patton 2011; Saari and Kallio 2011). The multi-criteria evaluation tool unfolds impacts of innovations on six dimensions. Specific emphasis is put on human and societal impacts, which are analyzed parallel with the traditional techno-economic

characteristics of innovations. The dimensions included are *impacts on citizens*, *employee*, *and population as well as impacts on reputation*, *integration of technology and services*, *and economy*.

This chapter is structured in four sections. The second section after this introduction presents the theoretical principles of human-centered co-evaluation method, including citizens, and employees' central role in the development of digital service innovation, and social and sustainable aspects of innovation. It also presents the methodological principles of the developed evaluation method, including the multi-criteria approach to evaluation and learning as a process of evaluation. The third section describes and operationalizes the new evaluation method. The fourth section discusses the novelty of the method and provides some practical implications for implementation.

4.2 Theoretical and Methodological Principles of Human-Centered Co-evaluation Method

In this section, we discuss the theoretical and methodological approaches that form the starting point of human-centered co-evaluation method. From the theoretical perspective, we start by discussing the need to strengthen the role of human being in innovation and the social and sustainable aspects of innovation. Then, we explain how the multi-criteria framework and the learning-oriented evaluation approach contribute to each other.

4.2.1 Agency of Human Being in the Evaluation of Digital Service Innovations

Frontline employees and citizens using existing services provide an important perspective for altering the services both in incremental or radical way. When services or their parts are digitalized, the relationship between the service provider and the customer changes. As service-dominant logic (S-D logic) (Vargo and Lusch 2004, 2008) has become the prevailing way of organizing offerings, customers are considered as active co-creators of value to adapt services to their individual needs. Service suppliers are motivated to understand and improve customers' mundane practices in order to create value for them. This does not only mean getting feedback from customers during a service but also gaining understanding of where and how offerings fit customers' overall activities. Co-creation opportunities are integrated into the service itself, in supplier's encounters with the customers. Mobile services demand new kind of active agency from the customers. For example, in the healthcare services, the traditional role of the citizen as "a recipient of services" is expected to become increasingly active, not only by taking care of his/her well-being but also as a user of mobile applications connected to health records and services.

Although the promise of co-creation within a single service is enormous, there are still doubts about how everyday needs of citizens guide service integration and a development of digital platforms. When thinking new digital service innovations from the perspective of a citizen and a potential user, it should be considered how digitalized services change their everyday life. Can the citizens really influence on offerings or are they only trying to adapt themselves as users to ready-made offerings? Understanding citizens' life in a holistic way, not only as service users, may open a new perspective to the development of new services. Research on what kind of everyday life produces well-being of the citizen (Korvela and Tuomi-Gröhn 2014) may draft another kind of "big picture" on how and what services should be digitalized or what kind of services should be integrated.

The frontline employee's role is in transition in the complex and digitalized service environment. The routine part of service work may disappear because of the digitalization. Automation usually aims to automate certain tasks rather than whole occupations, and bundles of tasks that cannot be easily automated always exist. A task-based approach to automatability in 21 OECD countries estimates that 9% of jobs are potentially automatable (Arntz et al. 2016).

However, as the face-to-face servant role of service employees may seemingly fade away when the technological interface pushes them into back offices, these employees may have the opportunity and space to form new agencies and adopt new roles and relations. They may become innovators of new services based on their deep experience with clients; enablers, helping and training clients to use technology; differentiators, giving a genuinely empathetic and personal face to the surface of the service; or coordinators, handling integration and building bridges between different offerings (Bowen 2016). Employee-driven perspectives on innovation consider employees as active agents in renewals (e.g., Høyrup et al. 2012). Case studies so far indicate that empowering and allowing employees to apply their customer know-how and ideas to service innovation increase preconditions for development, improve services, and positively influence their well-being (Hasu et al. 2014; Honkaniemi et al. 2015).

In the implementation phase of digital services, service workers' agency may depend on how quickly and smoothly customers are willing to adopt the role of co-producer of the service and be guided to increase the use of self-service with the IT system (Breit and Salomon 2015; Berger et al. 2016). Previous studies of e-government have perceived increases in staff workload because the staff must simultaneously assist citizens in digital communication and guarantee face-to-face service to the most vulnerable citizens who have neither the competence nor possibility to use digital services (Berger et al. 2016).

This perspective emphasizes the role of employees and citizens in the evaluation of digital service innovations. Human beings from the point of view of an employee and as a citizen should be involved into evaluation as learners, and their changing roles in digitalization should be considered. Their participation would bring in a significant view of everyday life to provide broad understanding on phenomena that are meaningful from the perspective of their health, lives, competences, motivation, and other existential aspects.

4.2.2 Societal and Sustainable Aspects of Innovation

The concept of sustainability emerged in research, policy, and organizational strategies in the 1980s as an attempt to explore the relationship between the economic development and environmental protection (Banerjee 2008; Pope et al. 2004). While there are a variety of definitions for sustainability, the most common is that of Brundtland Commission (Banerjee 2008; Mickwitz et al. 2011). According to it, sustainable development is "a process of change in which the exploitation of resources, direction of investments, orientation of technological development, and institutional change are made consistent with future as well as present needs" (WCED 1987, p. 9). In the recent literature (Banerjee 2008; Gendron 2013; Komiyama and Takeuchi 2006), the definition has been broadened to cover the balance between economy, society, and the environment.

Because of the complex nature of the sustainability challenge, a broad perspective has been called for in the problem framing: in the recent literature, systemic views have gained ground. These include the analysis of innovations at the system level; more specifically, the transition toward more sustainable socio-technical systems has aroused increasing interest (Geels 2010; Elzen et al. 2004; Mickwitz et al. 2011; Kivimaa and Mickwitz 2011; Smits et al. 2010). The perspective of socio-technical systems acknowledges the difficulty in solving sustainability challenges as isolated technologies and services and provides a framework for their analysis in the context of societal changes. It points out strong interdependencies between various elements of the systems in which the multiple network relationships are their essential characteristic. The composition of networks needed for the promotion of sustainable development is versatile: they include public authorities, industrial firms, financial service providers, consultancies, universities, etc. (Mickwitz et al. 2011; Smith et al. 2010).

System innovations in the area of sustainability imply major changes along the entire production-consumption chain: its flows, its multilevel architecture, and its institutions and structures (Smith et al. 2010; Weber and Hemmelskamp 2005). In the markets, central issues are the integration of clean technologies in safety standards and market rules and the promotion of effective and prospective market demand. The institutional framework is essential in order to go beyond technical aspects and include the enabling environment, which covers social mobilization and acceptance, institutional arrangements (e.g., laws and stakeholder roles), and financial and operational requirements (Van de Klundert and Anschutz 2001). It highlights the role of policy-making and governance processes in sustainability efforts.

The perspective of social innovation has been applied to improve understanding on the participatory and networked processes that are in the core of implementation, learning, and scaling up of innovations at the systemic level (Harrisson et al. 2010; Harrisson 2012; Mulgan 2007; Moulaert et al. 2013). Social innovations are characterized by two different aspects of "social": social by the ends and social by the means (Rubalcaba et al. 2013; Moulaert et al. 2013; Pol and Ville 2009). The first aspect refers to the societal challenges (e.g., social exclusion and aging

population) that innovations are aiming to solve. The second aspect refers to the importance of engagement and participation (Harrisson et al. 2010; Kahnert et al. 2012). The approach of social innovation highlights that collaboration between different actors and actor groups is essential: a prerequisite for the realization of broad society and population-level effects is the active engagement of various actors in the development of innovation.

Dissemination is a challenging task due to two characteristics of social innovations: local nature and the lack of codification. The contribution of social innovations is typically manifested as the density of local networks and as local vitality that may result in new jobs and market activities. Scaling up innovations from this limited context requires the strengthening of their systemic features. It also requires new types of R&D practices that can facilitate the codification of social innovations and the procedures applied (Harrisson et al. 2010; Moulaert et al. 2013; Pol and Ville 2009; Rubalcaba et al. 2013).

It is also worth noting that social innovation needs to be balanced with result orientation (in terms of effectiveness or economic growth). This balance is in line with the idea that efforts striving toward sustainable development must handle and balance different, sometimes conflicting needs that may be associated with a change process. A good example is needs related to effectiveness and innovation versus needs related to creating good working conditions (Elg et al. 2015).

4.2.3 Multi-criteria Perspective to Evaluate Service Innovation

The evaluation of innovations is typically based on traditional science and technology (S-T) indicators, which are highly oriented toward the technological aspects and economic impacts of innovations. This narrow approach has been criticized in service studies as it neglects the novelties based on immaterial values and interaction (Rubalcaba et al. 2012; Toivonen 2010). In particular, researchers have pointed out that the traditional evaluation methods and measures are not able to capture the diversity of innovations and the multifaceted performance in service sectors (Djellal and Gallouj 2013).

The increasing "servitization" of society has put pressure to develop more advanced approaches to evaluation. In some recent studies (Dyehouse et al. 2009; Williams and Imam 2007), a plurality of methods and starting points for new evaluation criteria have been suggested. According to them, impacts should be assessed on the basis of a multidimensional approach to take into account the issues of quality, reputation, social innovation, and social value (Djellal and Gallouj 2013).

The reasoning is rooted in the "broad view on innovation" (Dosi 1988; Kline and Rosenberg 1986; Lundvall 1992; Nelson and Winter 1982) that highlights complexity, uncertainty, and interactivity in the development and implementation of innovations. In other words, it favors a systemic perspective. Recently, the systemic and network perspective has become topical – not only in terms of multiple actors but also concerning the novelty itself. It has become apparent that the most urgent

problems in the present society cannot be solved via individual technologies or services, as these problems form systemic wholes and require systemic solutions (Harrisson et al. 2010). This development puts additional pressure on the renewal of evaluation of innovations.

The Djellal-Gallouj approach (2013) analyzes the diversity of innovations and the multifaceted nature of their performance by linking them to the idea of different "worlds of services." The concept of "a world" is derived from the "economics of convention," developed by Boltanski and Thévenot (1991), and refers to different justificatory criteria used in society in the definition of different values. Djellal and Gallouj (2013) identify six different "worlds" that provide criteria for evaluation: the industrial and technological world, the market and financial world, the relational and domestic world, the civic world, the world of innovation, and the world of reputation. The outcomes of innovation can then be evaluated from the perspective of different target areas: besides the traditional technical and financial aspects of innovation, the complex societal challenges and the specific characteristics of services linked to quality and social value are taken into account (Djellal and Gallouj 2010, 2013; cf. Rubalcaba et al. 2012). In addition to the different target areas, the approach pays attention to the timescale in the generation of impacts through the division into direct, short-term outputs and indirect, long term-outcomes. Table 4.1 illustrates the different worlds and the specific justification criteria (Djellal and Gallouj 2013) in a slightly modified form. In comparison with the original framework, "the civic world" has been replaced with the concept "responsibility world," which includes the original ethical issues linked to the equal treatment and fairness but emphasizes also social innovation and sustainability (see Rubalcaba et al. 2012).

On the other hand, the researchers are unanimous that the existing innovation and performance measures and indicators should not be abandoned. What is needed is a more diversified analysis framework that is able to take into account the multiplicity of innovations and the increase of their social and systemic nature (cf. den Hertog 2010; Rubalcaba 2006).

4.2.4 Learning Approach in Evaluation

A topical question in service research is how to develop innovations at the systemic level (Ostrom et al. 2015; Toivonen 2015). Learning between stakeholders has been proposed as a solution to these complex and multifaceted problems. Although scholars of service research have used the concept of learning (e.g., Lusch et al. 2010), they have mainly referred to firms' ability to learn to serve customers or to become vital and sustaining part of the value networks. Learning on the level of an entire value network, emphasizing active agency and intentionality of all the participants in relation to a societal problem, still needs to be elaborated.

There are difficulties in getting learning-oriented evaluation to carry out analysis from a sustainability perspective. As proposed by Brulin and Svensson (2012), learning in evaluation needs to become more critical and focus on capturing intended

Table 4.1 A multi-criteria perspective to the evaluation of services (Djellal and Gallouj 2013, modified)

	Industrial and technical world	Market and financial world	Relational and domestic world	Responsibility world	Innovation world	Reputational world
Output (direct, short term)	Volumes, flows, and technical operations (performance, efficiency, scientific principle)	Value and monetary and financial transactions, money, savings	Interpersonal and organizational relations, trust, quality of relationship	Values like sustainable development, responsibility, equal treatment, fairness, and justice	Creativity and inspiration	Brand image
Performance related						
Outcome (indirect, long term)						
Performance related						

effects, as well as those that are unexpected. In line with this idea, learning-oriented evaluations need to be ongoing (Brulin and Svensson 2012). The requirements of such an evaluation can thus be summarized under the following three points: (1) evaluate results and effects continuously, (2) contribute to learning in a development process and its continuous improvement, and (3) conduct contextual analyses and contribute to public value while also to help to ensure that the results become knowledge products that will be utilized.

The theory of expansive learning (Engeström 1999) derived from cultural-historical activity theory provides an avenue for learning-oriented evaluation. The conditions for learning are a critical component in evaluative efforts. In Engeström's theories, disturbances and questioning provide a foundation for learning opportunities. Expansive learning in a community begins when, during the course of activity, some individuals begin questioning prevailing goals, patterns, norms, or even basic motives of the activity and searching for new practices. In some cases, this escalates into collaborative envisioning and a deliberate collective change effort at grassroots level (Engeström 1999, 2001a, b), after which a new motive and expansive cycle follows. How is it possible to embed learning as a central mechanism in evaluation? A central opportunity is created by learning-oriented evaluation in terms of a broad stakeholder involvement contributing to more reflective ways of working.

In the evaluation process, the participants are offered a tool, which enables them to understand the service innovation in a wider context and long-term horizon. In our case, the tool is based on multiple values and criteria, and it is theoretically grounded as described in the previous section. The use of the reflexive tool and collective evaluation has been previously applied in developmental impact evaluation for innovation networks (Saari and Kallio 2011). In order to enhance dialogue between developers and potential distributors of the experiment, we need a method which provides equal listening of the different perspectives. An aquarium method has been used in solving severe conflicts in a work community and also as an evaluation method (Aalto-Kallio and Hakulinen 2009). It is based on active listening: it instructs participants to listen, allows them to communicate, and guides them to create further actions.

4.3 Human-Centered Co-evaluation Method

The new method consists of (1) a multi-criteria framework that will be used to evaluate various dimensions and values of the innovation and (2) a developmental evaluation process to support multivoiced evaluation and learning. We have combined these two approaches in a practical evaluation method, which is operationalized and described in detail in this section.

4.3.1 Multi-criteria Framework

Our human-centered evaluation framework evaluates impacts of service innovations from the perspective of six dimensions (Fig. 4.1). The dimensions included are impacts on citizen, employee, and population as well as impacts on reputation, integration of technology and services, and economy. The three first dimensions have been categorized as social indicators because they put emphasis on human and social aspects of service innovation. Three later dimensions emphasize technical and economic characteristics of innovations; they are thus categorized as techno-economic indicators. In the figure, the horizontal axis illustrates the scale of analysis: dimensions on the left-hand side in the framework analyze impacts and value from the perspective of individuals (including individual organizations) or a group of individuals. Dimensions on the right-hand side analyze broader impacts from the perspective of wider population, society, and economy.

In accordance with former evaluation approaches (cf. Djellal and Gallouj 2010, 2013; Hyytinen 2017), our framework analyzes societal impacts parallel with the more traditional techno-economic characteristics of innovations. Thus, it aims to create a balanced and comprehensive picture of impacts generated by a service innovation. Specificity and novelty in the new framework are the emphasis on human values, which means that evaluation includes the analysis of impacts from the perspectives of citizens and employees. Human aspects in the evaluation make visible the value from the perspective of various individual actors involved in service generation and utilization. Figure 4.1 crystallizes the main dimensions of the multi-criteria evaluation framework.

Each dimension in the framework includes a variety of aspects and possible areas of impacts. We have identified the potential impact areas and illustrated them with assisting questions. These questions help to analyze value from multiple perspectives. In the following, we present the potential impact areas included in each dimension.

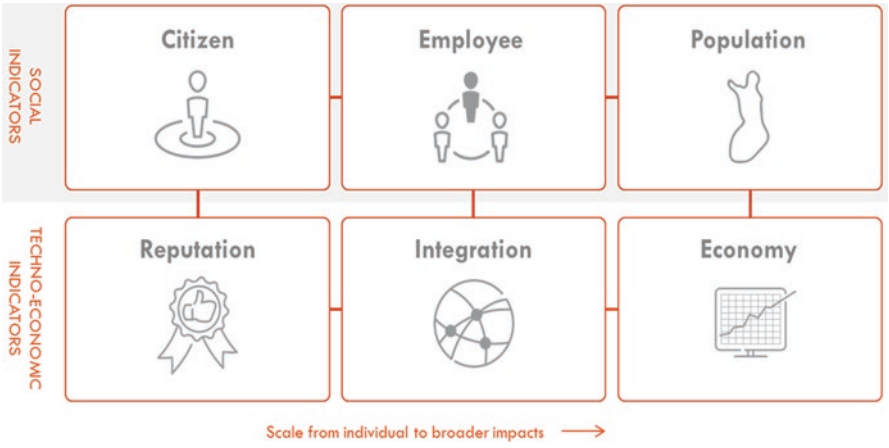

Fig. 4.1 Impact dimensions of multi-value evaluation framework

We also give examples of the assisting questions to concretize the application of the framework in a practical evaluation situation.

The impact on *citizen* analyzes the value of a new service innovation from the viewpoint of an individual service user. The emphasis is on customer orientation and the significance of a service, which in a concrete evaluation situation can be asked in a following way, for example: what kinds of customer needs has the new service resolved and how has the everyday life of the citizen changed? The dimension also focuses on service experience including accessibility and quality from the viewpoint of a citizen. Moreover, the impact on well-being, citizen empowerment, and relationships with the employee in charge of the service are reflected upon. This dimension requires a qualitative approach such as interviews of the service users and observation of service events as starting points for understanding.

The impact on *employee* focuses on changes in the content of work, including work roles, relations, know-how, and concrete tasks. In the concrete evaluation situation, the guiding questions are, for example: how has the new service affected the work role of an employee and what have been the main changes? Moreover, the dimension pays attention to collaboration and means of interaction; a specific focus is on the relationship with citizens and other employees. Also changes in well-being of employees are evaluated. This involves several aspects. Competence for conducting the task is generally conceived as a central criterion that provides a foundation for well-being. Another aspect is autonomy, which emanates from values and interests and a sense of choice and freedom for doing work.

Through broad forms of partnership, a better understanding is created on how technical, social, or economic solutions will be embedded in beneficiaries' lives. This is an essential element increasing the likelihood of sustainable solutions. Such partnerships link cooperation at different levels that are relevant for innovation (national, regional, local). The involvement of customers and citizens facilitates practical knowledge-based development and innovation, potentially leading to better coordination and more sustainable development work. It is, however, important to separate different groups of beneficiaries from each other. The impact on citizens and employees captures value from the perspective of an individual or a small group of individuals, whereas the impact on *population* focuses on value from a wider perspective. This dimension analyzes citizens' needs and service availability in the context of a specific geographical region, for instance. A concrete question in the evaluation situation may be how the new service meets citizens' need in this region or from the perspective of different citizen groups and how it affects the availability of services. In addition, the dimension includes aspects like social and ecological sustainability and equality and fairness in delivering the service.

As regards *reputation*, the focus is on the effects on brand image and on the visibility of actors involved in service development. In the concrete evaluation, this can be enquired as follows, for instance: how has the new service – or participation in service development – affected the brand image of involved actors? Moreover, attractiveness and the public image of the service are evaluated by asking, for example, the following questions: has the new service been discussed in public, what has been the public image, and how attractive is the new service from the citizen viewpoint?

Integration focuses on the value of the service and on the technology integration and interaction. This dimension aims to provide understanding on the questions: why are different services and technologies required for the new service development, how have services and technologies been integrated with each other and into the prevailing system, and what is the value of the comprehensive service solution? These aspects can be concretized as follows, for example: how have the different services been integrated to better serve customers' need or what kinds of technologies have been integrated into the new service and how is the integration managed? Furthermore, this dimension evaluates the functionality between different services and technologies as well as the means of interaction.

The last dimension, *economy*, focuses on economic effects of the service by considering them from the perspectives of both a single actor or an actor group and broader society. As regards the single actors, evaluation focuses, for example, on new potential resources, savings, and cost-effectiveness. These aspects can be captured by asking evaluators to specify the economic effects that the new service has generated. Besides these topics, this dimension aims to identify new possibilities in business and export.

In the actual evaluation situation, the aim is to capture the changes in accordance with each dimension. In concrete terms, evaluators are asked to consider how the new service has generated value from the perspective of each dimension. To make visible the potential disadvantages or surprises, evaluators are asked to consider both positive and negative changes as well as anticipated and unanticipated effects.

The evaluation approach can be applied in the different phases of a service development. To support the development throughout the process, we suggest that evaluation is conducted in an early planning phase, in the middle phase, and in the final phase of the development. In these different phases, evaluation has a different purpose. In the early planning phase, it supports target setting and helps to identify multiple target areas and foresee potential impacts of the new service. In the middle phase, it helps to justify the changes against the original targets and thus recognize the direction of changes. It also provides information if the development is going to the desired direction or if there is need to make any changes. Evaluation in the final phase concerns the generated impacts and provides an arena to plan next steps for scaling up or re-innovating the service innovation for the future. In the following, we illustrate how evaluation could be conducted as a participatory process to support learning and reflection throughout the development process.

4.3.2 Evaluation Process: Learning Between Developers, Users, and Enhancers

The evaluation process between developers, employees, citizens, and potential actors, who may promote the innovation experiment, provides an arena for learning and reflection along the development of an innovation. As mentioned earlier, the

purpose of a common tool and multiple criteria in the evaluation process is to create insights for the participants to understand the potential value of the service innovation from multiple perspectives and also in the wider societal context and long-term horizon.

In a practical evaluation situation, developers, employees, and citizens – who are the users and enhancers of the innovation – are brought into the same table to learn what has been achieved and what should be accomplished and done in the near future. We utilize the idea of two-phase evaluation from an aquarium method (Aalto-Kallio and Hakulinen 2009). In practice, it means that the facilitator guides who should evaluate, and who should listen, and thus ensures that different perspectives are equally heard in the evaluation situation. What we bring as a new element in terms of the aquarium method is the multi-criteria framework, which is used as a formal evaluation tool and a source of inspiration in the discussion between the involved actors. To create constructive interaction and dialogue is a challenge, when actors from different premises and interests come together. Learning from each other's viewpoints becomes possible only if the prevailing atmosphere is open and trustful. We suggest that active listening to each participant's observations and judgments of each element should be guaranteed in the process. For this purpose, using the aquarium method as an inspiration, we created a process model that instructs participants to listen, encourages them to mutually reflect and communicate about the topic, and guides them to create further actions.

In the model, which we call "co-evaluation," participants are divided into two groups: an inner circle and an outer circle. By co-evaluation we refer to the collaborative evaluation dialogue which is conducted inside each circle and between the inner circle and the outer circle. The inner circle consists of those who have been involved in developing the innovation, such as the managers, supervisors, employees, ICT-designers, and users of the service (citizens). The outer circle consists of those who have a possibility to promote the spreading of the innovation into wider use, such as the directors, collaborators from other services, and funding agencies. Figure 4.2 represents the positions of the inner and outer circles in the evaluation situation.

Fig. 4.2 The inner and outer circles in co-evaluation

The evaluation process also needs a facilitator, who provides a rhythm to the interaction. The pros and cons of each element become visible only if contradictory viewpoints are allowed to collide with each other. Before the interactive process, the basic information of each element and its qualitative and quantitative indicators should be collected as basis for collective sensemaking and judgment. The aquarium method gives space first for the reflection of the developers and then for those who may give resources to the innovation.

The inner circle evaluates how the innovation has succeeded in each element. They discuss what the measures of each element mean and add their reflections to each element. In this phase, colliding perspectives are allowed and valued. The six-dimensional evaluation tool as a printed poster is placed either on the table or to the wall. The discussion is documented on post-it papers which are then located into boxes of the tool.

While the inner circle conducts the evaluative dialogue, the outer circle is not allowed to speak, but their task is to actively listen to the evaluation. They may make notes and observe which perspectives collide with each other; they also develop ideas for developing the innovation further.

Thereafter, the inner circle and outer circle exchange their positions. Now the outer circle is allowed to discuss, and the inner circle only listens. The participants of the outer circle should discuss what they have heard and what they may conclude from the inner circle's evaluation. They should sum up their discussion by writing down their suggestions on a separate paper and then by presenting what are the lessons learnt, what should be done next, and how they may contribute to the implementation.

The inner circle then comments how feasible the suggestions are. They may remove some of the suggestions and add their own ones. Finally, they decide who should promote each act and when.

4.4 Conclusions and Discussion

In this chapter, we have introduced a new human-centered co-evaluation method for the evaluation of service innovations. The new evaluation method responds to the current evaluation challenge, which has been noted within both service innovation research and within evaluation research. According to the former studies (e.g., Djellal and Gallouj 2010, 2013; Patton 2011; Rubalcaba et al. 2012), the evaluation of service innovations tends to focus on single values of technological progress and cost efficiency, which are too narrow to describe the multifaceted, interactive, and systemic nature of services.

The new method provides an alternative by emphasizing the systemic and collaborative nature of service innovation. It integrates a multi-criteria framework to

evaluate multiple impacts and values of innovation (Djellal and Gallouj 2010, 2013; Hyytinen 2017) and a developmental evaluation process (Patton 2011; Saari and Kallio 2011) to support multivoiced evaluation and continuous learning. The multi-criteria evaluation tool unfolds impacts of innovations on six dimensions. Specific emphasis is put on human and societal impacts, which are analyzed parallel with the traditional techno-economic characteristics of innovations. Dimensions included are impacts on citizens, employee, and population as well as impacts on reputation, integration of technology and services, and economy.

We propose that the human-centered co-evaluation method could, by clarifying the multiple values of services, leverage the scaling up of new solutions and enhance the service organization's ability to conduct and learn from the evaluations. The new method, based on a reflexive evaluation approach, facilitates interaction between developers and potential supporters; thus, it provides a promising alternative to foster the continuous development and learning throughout the innovation process.

We argue that a balance between human-centeredness and the result-oriented aspects (i.e., effectiveness and economic growth) in evaluation requires a sensitive, mixed-method approach in order to capture the impacts on peoples' lives and sustainable development. This means that both quantitative and qualitative data is utilized as a starting point for reflections in collective evaluation events. There is a need to involve sensemaking of the different stakeholders into complex innovation processes. This is in line with recent discussion in the evaluation community: evaluation itself should be a caring and ethical practice, providing arenas for reflecting and influencing on the significant phenomena for the humanity such as climate change, digitalization, use of artificial intelligence, future work, and pollution (Visse and Abma 2018).

As a managerial implication, we suggest that evaluation capacity should be know-how of each organization who develops and innovates services. However, learning-oriented evaluation processes do not take place spontaneously but require a facilitator, who is trained in evaluation methods and who can use his or her time and effort into designing and conducting collaborative evaluation processes (Ensminger et al. 2015). In such an evaluation process, learning from the failures becomes possible. This may be called evaluation capacity building of the organization. It may be know-how of the professionals, but it should be used between organizations. Furthermore, the generation of new type of systemic indicators to describe complex and collaborative processes in the generation of impacts would be both interesting and useful from the viewpoint of management and decision making, too.

It is important to reveal and ponder what kinds of values guide the development of digital services and create methods to intervene it. Evaluation provides an opportunity to look for new practices, question changes, and improve them (Dahler-Larsen 2019). When human-centered co-evaluation method is used, it may offer an arena for learning between stakeholders and thus lead into more ethical, inclusive, and human-centered digitalization.

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Part II
Approaches and Case Studies on Human Interaction in the Service Context

Chapter 5
The Changing Everyday Life of Families and Young People

Anne Nordlund, Sanna Sekki, Pirjo Korvela, and Jussi Silvonen

Abstract This study focuses on analysing everyday life and mastery of everyday life in families and among young people. Our aim has been to examine the impacts of digitalization and to find out opportunities provided by a sequence map as a tool for getting better grip on everyday life. We gathered data in three projects using field notes and in-depth interviews as data collection methods and content analysis as the method of examining and interpreting the data. Our analyses reveal the multidimensional nature of the digitalized daily life: passiveness on the one hand and the permeability of digitalization in daily chores on the other. The results indicate that both families and young people have problems with everyday life mastering and need support in daily life. The sequence map proved to be a promising tool for supporting the adaptation to constant changes. The map helped recognize daily problems and reorganize the structure of everyday life – it facilitated following the changes and new rhythms. Based on our study, we conclude that digitalization is not a separate part of daily life but intertwined with everyday actions. Its impact also should be studied intertwined in daily actions. A specific challenge among young generations is controlling the excessive use of digital devices.

Keywords Everyday life · Everyday life mastering · Digitalization · Sequence map

A. Nordlund (✉) · S. Sekki · P. Korvela
University of Helsinki, Helsinki, Finland
e-mail: anne.nordlund@helsinki.fi; sanna.sekki@helsinki.fi; pirjo.korvela@helsinki.fi

J. Silvonen
University of Eastern Finland, Joensuu, Finland
e-mail: jussi.silvonen@uef.fi

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5.1 Introduction

We live in a 24/7 society. Digital technology has attained an established place in our society. It is a dimension of daily life that connects different activities, in contrast to the situation when it was just a separate part of work or leisure time (Greenfield 2017; Koiranen et al. 2016). According to the fifth "digital barometer" (2018), Finland is one of the leading countries in utilizing digital technology at three main levels (preconditions, usage and effects) and sectors (business, citizens and public). The Finnish government also actively supports digitalization with so-called key projects that are based on the government program. An example of the aims linked to digitalization is experimentation and deregulation to digitalize public services (Ministry of Finance 2017).

Digitalization provides many opportunities, but, on the other hand, it simultaneously requires skills to control one's own behaviour and activities. The advantages of technology depend on the skills of users. Digitalization creates tensions between humans and technology by creating promising opportunities and tools for everyday life, but at the same time, the adoption of new technical innovations is demanding (Feather 2004). It is also restricted by barriers – a phenomenon that Feather (2004) describes as a paradox of information society. According to him, information society offers new possibilities for individuals, but simultaneously there is social inequality between groups, regions and nations.

Thus, a need for further studies about citizens' new roles is apparent in the midst of societal changes (Leväsluoto 2017). The aim of this study is to examine how the everyday life of families and young people is linked with and affected by digitalization. Societal changes are experienced in everyday life as well as in working life; digitalization has changed interaction and daily activities in families and in work-related processes. A specific focus on young people is justified because these "Digi natives" are born in the digital era and using digital devices is natural for them, whereas older people have to learn new skills and a new way of thinking.

The theoretical framework of our study is based on activity theory (Engeström 1987), critical psychology (Schraube and Marvakis 2016) and neighbouring research streams. We utilize the concept of "the conduct of everyday life" for researching individuals' digitalized everyday life. A central interest of the study is the complexity of this phenomenon. According to Engeström and Sannino (2011), contradictions are characteristic of changes. The sequential structure of everyday life (Korvela 2003) acts as an analytical tool in our analyses. We apply a "sequence map" to gain understanding on the everyday life of families and young people.

The structure of the chapter is the following. First, we present our theoretical background. As parts of it, we introduce the central concepts for structuring everyday life, study how digitalization is combined with everyday life and analyse how changes of working life influence everyday life. In the end of the theoretical section, we present our research questions. The subsequent section concerns the implementation of the study. Following that, we describe the data collection and analysis. Finally, we present our results and summarize our findings.

5.2 Theoretical Background

5.2.1 Concepts for Structuring Everyday Life

We start our study by introducing central theoretical ideas for examining digitalization and its consequences for human subjects. We are interested in the role and meaning of digital technology in conducting everyday life. In this chapter, digitalization is examined as manifestations in digital devices, interpreted as material artefacts (Greenfield 2017; Vygotsky 1978). From a sociocultural viewpoint, the human being innovates technological devices and uses them to affect daily living. Simultaneously, technological devices shape our thoughts and actions (see more in Schraube 2013). According to Schraube (2013), technological things "are not determinants but possibilities to act", which means that human beings are able to make decisions against the current situation instead of reacting to a stimulus coming from digital technology (phone ringing, receiving an email or a Facebook message).

In the research literature, digitalization contains inconsistent and contradictory elements (Schraube 2013; Schraube and Marvakis 2016). For example, in the context of higher educational learning, digital technologies can expand a student's learning processes by facilitating the use of different databases and sources of knowledge. But digital devices provide only limited support for the learning process; there is need for human brainwork and interaction with the environment and other people (see Schraube and Marvakis 2016). The concept of "conduct of everyday life", applied in this chapter, describes the whole entity of individuals' life areas: it is a kind of integration of individuals' actions in different life contexts (Holzkamp 2016). According to Thomsen (2014), the conduct of everyday life is an activity of "every single day" with a view on organizing, integrating and constructing daily life in such a way that the various contradictory demands with which the individuals are confronted can be united and "sorted out".

In critical psychology, the concept of "conduct of everyday life" describes the societal structure of everyday living (Schraube and Hojholt 2016). According to Dreier (2016), people conduct everyday life while taking part in social practices in different contexts. In the Western society, there are contexts that demand daily, regular or occasional participation. Moving into and across different contexts means entering other practices and positions. People have an individual procedure for the activities they participate in during the day. The meaning of daily routines and habits varies from person to person and in different age groups, for example. Over the course of time, a person's preferences and commitments about conducting everyday life will change several times (Dreier 2011, 2016).

From the perspective of subject-oriented sociology, the focus of everyday life deals with aspects of social and personal action that provide and communicate structure. Therefore, it is not merely a dichotomy of structure and subject (Jurzyk et al. 2016). Conditions of the conduct of everyday life are created by uncertainty. Demands and opportunities create ambivalence and pressure on everyday life; life is characterized by insecurity. Various means and perspectives are needed for conducting different areas of life.

In the research literature, several ways are used to describe the structure of daily living/everyday life. Zerubavel (1985, 2003) describes the rhythms of daily living, and Lefebvre (2005) presents an advanced methodology for the analysis of the contradictory aspects of our everyday world. In this study, we are interested in the microcosm of family life as described in our empirical studies (Korvela 2003; Fågel et al. 2011; Sekki 2018).

The sequence is a concept that has been widely used for indicating the temporality of everyday life (Southerton 2006; Dreier 2016). According to Southerton (2006), the sequence indicates the order in which daily activities are conducted. Everyday life consists of fixed practices that have been bound to the time and are typically carried out in co-participation with other people. Everyday life also includes practices which can be described as "time fillers" (Southerton 2006).

The basic frames for the sequence structure come from cultural and societal structures, such as adults working outside the home, children going to school, day care outside the home, etc. (see Holzkamp 2016). The sequences (at home) are based on family-specific routines; in other words, families accomplish different actions during a day. In the morning sequence, families might have breakfast, children might watch children's programs on TV, or parents might read the daily news (Korvela 2003). Routinized actions are developed over time to make (family) life fluent. Zucchermaglio and Alby (2014) emphasize the central meaning of domestic routines. Without routines, (family) life would be chaotic and difficult to manage as actions need to be reinvented all the time during the day. When daily life is routinized, "it seems that things take care of themselves".

This study focuses on contradictory daily life, which appears in the progress of the digitalization. Engeström and Sannino (2011) have developed a methodological framework for analysing contradictions in the context of organizational change interventions. There are contradictions that promote changes in organizations. The authors emphasize that contradictions cannot be studied directly, but consideration should be directed to their manifestations. In our study, we are interested in the digitalization-based manifestations of contradictions in the daily activity of families and young people.

Our main analytical tool – a sequence map – has its origin in Korvela's (2003) study. She has identified the sequential structure of everyday life in the analysis of video-recorded data from families with children. The sequence describes the order of the different phases of the day and their temporal bonds. One day in the life of working families with children consists of 4–6 sequences. The actions of the morning sequence prepare family members to leave home. After work and day care, family members' actions produce a sequence of "coming back home and settling down". This sequence brings out the family members' need to rest and relax before other activities. After settling down and "activating" the home and its infrastructure again, it is possible to do something together until it is time to go to sleep. The sequence structure is shared with the families living in the same family phase. It means that the same phases of day and night can be recognized in these families, but the families construct the sequences in their own way. According to Korvela, the sequential structure of each day is a supportive structure for everyday life, as families do not need to negotiate about and decide how to construct the ongoing day all the time (Korvela 2003).

5.2.2 *Everyday Life and Digitalization*

While we are interested in individuals' views (using the viewpoint of critical psychology), we take into account that the actions of individuals have an effect on social structures and vice versa (Thomsen 2014). During recent decades, society has changed due to digitalization, in particular. Thus, we also frame our study by describing digitalization at the societal level (in daily life and working life). Digitalization is also part of ongoing cultural change (Chaney 2002). The role of citizens is changing, too; they are seen as active participants in promoting their own well-being (Leväsluoto et al. 2017).

Based on the Official Statistics of Finland (2017), 88% of Finnish people, aged between 16 and 89, used the Internet during the last year, and 73% used it several times per day. The number of digital equipment in households has increased considerably. In 1990, around 10% of households had a computer, whereas in 2015 90% had a computer and an Internet connection (Lehti and Rossi 2017). However, a more thorough examination of the statistics shows that there are major differences in the use of the Internet between age groups and population groups. For example, the use of electronic authoritative services was 90.3% in the age group 13–34 years and 60.6% in the age group 55–74 years. In addition to age, the level of education, the residential area and the income level influence the use of the Internet. According to PISA 2015 study, 15-year-old people use digital media several hours per week: 80% have been chatting; 71% used social media; 53% have read online news; and 46% used email. The study reveals that 40% retrieved information from the Internet for learning purposes; 38% retrieved practical information; 23% read blogs; and 19% participated in discussion forums. The interviewees in the PISA research were also asked about the times they used digital media: 85% used the Internet, chat and social media before they left for school and almost everyone (96%) after the school day (Sirén et al. 2018).

Digitalization challenges everyday life both in the service sector and in homes. Familial times are characterized by communication, the use of information and media technologies. Digitalization has emerged as the Internet and mobile-based solutions have been developed and social media has expanded communication and social relationships. In the future, more and more services will be online; so, access to services will be difficult without the Internet (Koiranen et al. 2016). Furthermore, digitalization is not just about equipment; it also questions existing procedures and requires more practical and flexible solutions, such as diversified public services.

In domestic spaces, digitalization offers many new opportunities for conducting daily life, such as creating flexible schedules and practices (Nansen et al. 2009). A pervasive change based on digitalization is the increase of availability and the possibility of maintaining connections all around the world. One of the positive consequences is time saving as shopping and taking care of various tasks can be carried out at home. On the other hand, the daily rhythm has extended, which has caused problems in everyday life and in relationships to society. For example, later bedtimes affect the amount of sleep, which may lead to delays and absences from

school or work (Sekki and Korvela 2014). In the evenings, it is typical to try to refrain from using digital media, but while email is turned off, television or some other device is turned on (Nansen et al. 2009).

Based on earlier research, it seems that digitalization causes difficulties in mastering everyday life especially in families battling with multiple problems (Ciczkowska-Giedziun and Zmyslowska 2017). According to Sekki (2018), watching television takes parents' time from necessary household routines and childcare in families with complex problems. Everyday life out of regular rhythm and routines and with a weak relationship with society can be described as "drifting everyday life" (Sekki and Korvela 2014).

Previous studies have also described the contradictory consequences of digitalization. According to Graesch (2013), family life is characterized by being in a hurry with constant time pressures, schedules and deadlines. Family evenings consist of several time commitments, like attending children's after school events. Fragmentation of time and multitasking are typical concepts used to describe the 24/7 society. However, Sullivan and Gershuny's (2018) analysis does not support the general idea of "speed-up society" but revealed differences in time intensity by gender and occupational status. Professionals in higher-status positions reported time pressures and the feeling of rush more often than those with lower-status positions. Mothers with a career and single parents also suffered from time pressures. According to Ylikännö (2015), Finnish statistics show similar results about time pressures between the genders. Yet, there is no evidence that higher education explains feeling rushed in the Finnish society. The statistics show that rushed feelings are in line with expectations about time use in general and in different life phases. Time pressure was also determined in numbers; for working Finns, the threshold is 210 minutes of free time per day. In other words, more free time than that means you are not objectively suffering from time pressure in daily life.

5.2.3 Challenges of the Changes of Working Life to Everyday Life

When examining the changing structure of everyday life, it is also important to pay attention to changes in working life – working life is an essential part of everyday life. Digitalization has a remarkable role in the changes of working life, and these changes are linked to global megatrends, which also affect everyday life (Linturi et al. 2013). The globalization of telecommunications, the Internet, virtual presence, transportation, business of capital and transition of jobs are proceeding, and there are changes in the economic power centres of the world. The population is ageing, and the average family size is becoming smaller.

Part-time jobs are common, especially for female workers, due to the need to combine work and family. As Jurzyk et al. (2016) note, women construct their everyday life to a large extent around the needs of the people for whom they feel responsible. The expectation of gender equality is acute particularly for women who

work and have family responsibility. One solution is to bring paid work home and into family time. In Korvela's (2003) study, it was possible to see how the need to work with a computer at home interrupts the sequences of "doing something together" and "putting children to bed". The mother tries to squeeze the sequences into a shorter time slot, which causes tension between family members. From the point of view of freedom, the question is of a possibility to carry out paid work and to combine work life and family issues. The current work life also requires mobility, which leads to working as freelancers or as self-employed entrepreneurs. Many employers offer contracts of employment on a zero-hour basis; here, working hours are irregular and income conditions insecure.

The present tendencies set demands for coping with everyday life. Jurzyk et al. (2016) have found four tendencies of modernization, which can help in shaping the structure of everyday life. Rationalization of the conduct of life is a tendency in which old and new forms of mastering everyday life are combined. Individualization is a tendency in which personal stability, readiness to take risks and self-confidence as well as autonomous decision-making are essential. Equalization of gender relations is the third tendency, but Jurzyk et al. (2016) remark that this requires a strong female network to combine everyday life and working life. The "workification", as the fourth tendency, includes social differentiation and increased options, but at the same time, the complexity of everyday life increases. The routines create the continuity in all the types.

5.2.4 Research Questions

In the analysis of the change of everyday life, we apply the concept "the emerging new" – it is considered to be an indicator of change. Our research questions are:

1. How is digitalization linked to the everyday life of families and young people? Young people are "Digi natives", i.e. they are born in the digital era, and using digital devices is natural for them, whereas older people have to learn new skills and a new way of thinking.
2. How can a sequence map be used as a tool that supports the everyday life of families and young people?

5.3 Implementation of the Study

In our study, we use the sequence map both as a theoretical tool and as a method for data gathering (cf. Newman and Holzman 1993). Figure 5.1 illustrates the sequence map in the form applied in the context of family work for supporting daily life. In our projects, explained in the section on data collection, we studied the supporting function of the map in the everyday life of families and young people. The

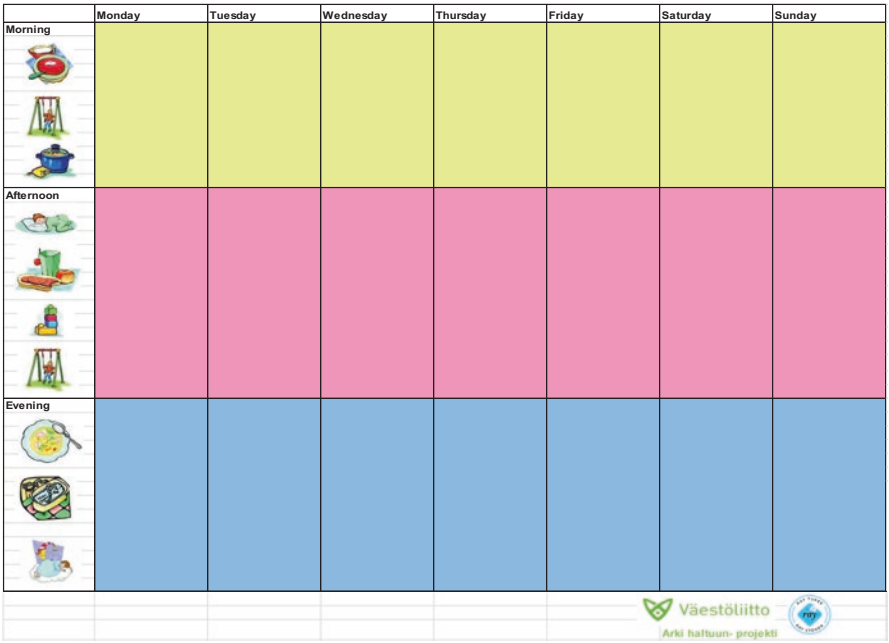

Fig. 5.1 The sequence map (developed by the Family Federation of Finland in connection with the Getting Grip project)

implementation of our projects was research-oriented, i.e. data was collected for scientific purposes. The map was created in interaction between the client (a family, a young person) and the project employee (e.g. a family worker or a project manager as a coach). When working with a sequence map, the client is the essential informant concerning the life situation and management of everyday life. In other words, the map requires the client's contribution (Kupiainen and Holmberg 2011; see also Sekki 2018). Interaction between the client and the project employee in constructing the sequence map produced our research data. Next, we will describe its theoretical frame of reference and practical use in some more detail.

As mentioned in the literature analysis above, the sequence map is based on the idea that it supports (families) in creating a regular rhythm and routine for daily living (Jonsson 2006; Fågel et al. 2011; Sekki 2018). Korvela's findings (2003) about the sequential structure of everyday life were essential when Väestöliitto (The Family Federation of Finland) started to develop a practical tool for the support of families (work). Korvela's research was theoretically based on the cultural-historical activity theory (Vygotsky 1978; Leont'ev 1978; Engeström 1987). Also Sekki (2018) has analysed the sequence map using the same theory. Her study focused on the everyday activities of families during home visits when the map was used and developed in families. Peavy (1997) has developed different maps, for example, the life space map, for working with clients. Unlike Peavy's model, the sequence map is outlined chronologically. The concept of sequence has also been utilized in

psychotherapy for studying the interaction between therapists and customers at the micro-level. In this context, Leiman has developed a tool called dialogical sequence analysis (DSA), based on cultural-historical activity theory and Bakhtin's central ideas (Bakhtin 1990; Kivikkokangas and Leiman 2018).

The main focus in constructing a sequence map is time. Based on the clients' activities, it is possible to divide the day into smaller parts, for example, morning, afternoon and evening (see Fig. 5.1). The map offers a flexible framework for various need-based activities. It directs joint discussions in constructing a more regular structure of a day for each client with specific needs. The clients' needs are the central starting point in the method. Therefore, there are as many variations of the sequence maps as clients (individual or family). As clients' needs and life situations differ, it is not possible to apply a ready-made map of one client into other clients' use. One of the major benefits of the sequence map is that it makes client's daily life more visible for the workers as well as for the clients themselves. The real structure and nature of the daily activities, instead of the assumed and desired one, is essential in working with clients. If a family, for example, does not recognize some routines and has been unconscious of some key elements of their living and activities, such as neglected household chores or care of children, they cannot verbalize them to workers, and thus a contradictory element keeps remaining in their life.

As visualizing daily practices, the sequence map may help to change current practices together with the family worker. After the daily routines have become more fluent, clients will have more energy and resources for taking care of other problems they have, such as a drinking problem, a marital problem, etc. (Kupiainen and Holmberg 2011). In general, the sequence map can be characterized as a client-oriented working method which corresponds to current trends in the societal service systems. Clients are seen as active actors in the area of social and health services, for instance (Kettunen and Möttönen 2011). The map can crystallize the meaning of the daily routines; clients can construct based on their needs.

Due to changes in society, a digital (smartphone) application of the sequence map is currently under development in Finland (Nordlund et al. draft). A similar application, "MySocialworker", has been successfully developed in Denmark. In this context, Mackrill and Ebsen have introduced the concept of assessment: it refers to the definition of the issues that need to be considered when developing and implementing technology in social work for young people (Makcrill and Ebsen 2017).

5.3.1 Data Collection

The data of our study originate from three projects: the "Getting Grip" project (2007–2010), an employment project (called here "Net") for young people (2010–2015) and "Service revolution" project (2015–2018). Project employees were responsible for the collection of the research data; the data collection methods were in-depth interviews and field notes and audio recordings based on the home visits.

The sequence map was a tool for producing research data. Simultaneously, there were efforts to support the everyday management of the families and young persons by means of this map. All three projects were based on interactions between professionals and clients while working with the sequence map. As the projects were carried out during 10 years, the data reveals effects and changes that are linked to digitalization in everyday life. The number of digital devices essentially increased in the families involved during the course of the research.

The "Getting Grip" project (2007–2010) concerned the way in which social work could promote the mastery of everyday life in families. It was conducted regionally in Southern Finland by the Family Federation of Finland and funded by Finland's Slot Machine Association. The aim of the project was to develop and experiment a new tool for family work supporting drifting in everyday life. During the project, families received intensive support at home. Family workers conducted up to three home visits per week during a 3- to 6-month period; there were also follow-up visits 6 months after the end of the working period. In this project, the primary purpose of the sequence map was to create a regular rhythm and routines for everyday life (Fågel et al. 2011; Kupiainen and Holmberg 2011). Thirty families participated in the project, and ten families were chosen for the study. Families participating in the project were chosen by municipal social workers from the clients of child welfare. The research families were chosen to get diverse experiences of utilizing the sequence map in families. The data comprise family workers' notes of home visits, 330 pages in total. They also include some audio-recorded home visits, but the notes are the principal data. Family workers wrote the notes after every home visit. They described the progress of the visit, wrote down what was done and said and evaluated the family's situation. The notes also included discussions related to the scheduling and planning the progress of the day with the help of the sequence map.

The "Net" (2010–2015) was an employment project: it aimed to promote the motivation or ability to obtain a job or education among unemployed young people. The responsible organization in the project was Edupoli and adult education centre in Helsinki metropolitan region. The project was funded by the European Social Fund and was an application of the Youth Guarantee program in Finland (2018); it was actually one of the first projects to implement this program. The project, as well as the program in general, developed working practices to solve socio-economic problems caused by youth unemployment. Coaching formed the basis of the program and covered themes like job seeking, study plans and the management of everyday life and the future. Four hundred fifty young clients participated in the project services: labour market training, job seeking groups or individual coaching. About 270 of them participated in individual coaching only. Our data consists of the interviews of six clients and focuses on their everyday life mastering. The respondents were interviewed four to nine times. The interviews resulted in 400 transcribed pages. The sequence map was a data collection method in the interviews (Newman and Holzman 1993). The interviewer had a dual role as a researcher and a coach.

Also the third study focused on unemployed youth, studying in Edupoli. The study belonged to a bigger project "Service revolution", funded by Business Finland

(the full name of the project was "The revolution of service economy – Human being at the core of digitalization"). Seventeen students participated in this study. They were 20–29 years old and had started vocational education at Edupoli after being unemployed. Some of them had interrupted earlier studies, and some had undertaken no education since the primary school. Participation in the education was financed by the national skills program for young adults. In our study, we collected data of this target group via interviews, which were conducted by teacher education students from the University of Helsinki. The interview topics included everyday life rhythms and changes in them in connection with transitional stages: the use of time, the feeling of competence, the future orientation and the use of digital devices and social media. In the present chapter, we will focus on the last-mentioned topics linked to digitalization.

Data collection and methods are summarized in Table 5.1.

5.3.2 Data Analysis

In our analysis, we applied qualitative content analysis in two cases; one case was analysed using the sequence map (Korvela 2003). In the other two cases, the sequence map was also in a central role, but it was used as a coaching tool, not as a research method. Content analysis is usually utilized when research literature related to the phenomenon is limited (Hsieh and Shannon 2005), which was the case in our study. The analyses proceeded in dialogue between theory and data by coding and creating categories (Charmaz 1995). A kind of "coding scheme" makes this process systematic and logical. While reading the interviews and the diaries of family workers, we picked up frequent themes and classified and structured them into categories. Each category was named according to its content, divided into subcategories and in the last stage grouped into major categories (Hsieh and Shannon 2005; Elo and Kyngäs 2008). Hence, categories are created through the analysis process (Hsieh and Shannon 2005). In the following, we will briefly describe the main points of analysis in each project.

Table 5.1 Research data and methods

Project	Data collection structured by the sequence map	Methods	Collector of the data
Getting Grip project (2007–2010)	Field notes and audiorecordings based on home visits	Qualitative content analysis	Family workers, Family Federation of Finland
Net project (2010–2015)	Interviews	Qualitative content analysis	Project Manager (as a coach), Edupoli
		Sequence map	
Service revolution project (2015–2018)	Interviews	Qualitative content analysis	Teacher education students, University of Helsinki

In the analysis of the family-work project (the "Getting Grip" project), seven main categories were identified: structuring everyday life, families' everyday challenges, functionality in everyday life, relation of the home and society, social interaction in the family, everyday life of children and young people and resources of parents. The use of the sequence map and the dimension of structuring everyday life have been thoroughly reported in an earlier research article (Sekki and Korvela 2014). In this chapter, we take *families' everyday challenges* to a thorough examination. This category contained various challenges related to the daily life of families (economy of the family, eating habits, passive leisure time); the digitalized everyday formed one important dimension. It was common to all the challenges that an attempt was made to solve them in some way within the working period. During the project, digitalization proceeded fast, and the analysis brings out first impressions of its consequences. Television is included in the analysis because it has a central meaning in families' daily lives.

The analysis of the situation of six unemployed young persons in the "Net" project was carried out using the sequence map as the method. In the analysis, four main categories were identified: everyday life mastering, seeking for a job or education, future plans and the use of social media. The personal and individual elements of everyday life mastering were identified from the research data based on filled-in sequence maps and discussions about everyday life mastering. The sequence map helped to identify every individual's day rhythm. With the help of the sequence map, the use of social media was also identified.

The analysis of the third study focused on the everyday life mastering and particularly on the use of social media as a part of everyday life. In the former focus, three main categories could be identified: actions of everyday life (eating, working/studying, leisure, sleeping), the rhythm of the day and the use of social media. The use of social media was a part of using digital devices. In the analysis, six subcategories of using social media were found: email, Skype, Facebook, Twitter, WhatsApp and Instagram. The categories were identified from the themes of the theme interviews.

5.4 Results

In the following, we present the data-specific results of the three studies in chronological order according to the implementation of the projects. These studies reveal various dimensions of digitalization and a need for support in the daily life of families and young people. Thus, in each case, we first describe the effects of digitalization; second, we justify the introduction of the proposed tool, the sequence map, for supporting the mastery of everyday life. We report our findings using several quotations to highlight our argumentation. We use pseudonyms when referring to the families and young people.[1]

[1] The interviewees have been anonymized. Because of a consistency, we have translated the interviewees' names into English.

In the first study (the "Getting Grip" project), we identified two dimensions of the digitalized daily life: *a need to learn new skills* and *increasing passiveness* due to the growing use of technical devices. As regards new skills, our analysis confirms the paradox of the information society (Feather 2004): there are lots of new possibilities for taking care of daily matters, but simultaneously challenges arise if people do not have enough capacity to use technical devices and digital platforms (cf. Leväsluoto et al. 2017). Examples of the "fast-forward" development, which requires families to learn new skills in ordinary activities, are communication with school and using e-services for jobseekers. Fluent cooperation between the home and the school is especially important if children have problems at school.

In a digitalized society, a memo pad is no longer a relevant tool for communication. In Finland, a new data system (Wilma) has been introduced for the interaction with families in primary and secondary schools. This is a big change as the computer was previously used just for communication with relatives who lived abroad. Our study showed that parents needed support in using the Wilma system. For example, the Yang family had difficulties with the implementation of the new system; during a home visit, parents expressed astonishment about the new user identification they had received from school. The family was given support for a couple of months in the use of the new system. Checking of the Wilma messages was part of the activities during home visits until the new way of communication was felt natural by the users. New activities were marked on the sequence map according to the basic motive of this map: to routinize behaviour (Kupiainen and Holmberg 2011). A family worker had made the following note:

> The family showed the notice that had come from the school, which informed them about the Wilma system and communication between the home and the school. We went through unclear sections in the notice and promised to advise in the use of Wilma during the next home visit. (Note the 4th home visit of a family worker)

A sign of the increasing passiveness in daily life was that both parents and children spent several hours per day in front of the screens (television, computer). They used the time necessary to undertake routines concerning care and housework for this purpose, which caused problems in daily life (cf. Sekki 2018). Our result is in line with the study of Twenge et al. (2018), which shows that the use of digital media has increased considerably: for example, adolescents spend 4–6 hours per day with screens (Internet, texting and social media). Our study shows that families themselves recognize the increasing penetration of digitalization into their everyday life. They also asked for support to limit it. During the working period, the sequence map was utilized with two mothers (called Smith and Jameson) and with children of one family (called Robinson).

The mother of the Smith family asked family workers to intervene, with the help of the sequence map, in television watching. She was worried because the family members did not communicate with each other due to television watching; thus, the evening sequence was inadequate. She desired for more shared family time, and the sequence map was used to reorganize the family's afternoons and evenings. The

mother defined the permitted television viewing hours; the TV was allowed to be turned on later in the evening. A family worker's note illustrates the change:

> The mother had taped a slip of paper to the television; it says: DO NOT TOUCH. (Note the 15th home visit of a family worker)

According to the family workers, the mother tried to find the best ways to limit television watching. The slip of paper worked well as a reminder. The children adapted well to the new practice, but the mother herself had more difficulties; she felt that she was left without something. Due to changes, the common activities increased in the evening sequence: for example, the family started to clean up the children's playthings, to organize children's board games and to prepare clothing for use on the following day.

Watching television took a lot of the mother's time in the Jameson family too. She described the progress of the evenings as follows:

> When "Days of Our Lives" starts, I do not do anything, just make evening snacks for the children or similar small things. It starts at 4.40 p.m. (Audio recording, Jameson mother, the 11th home visit of a family worker)

The evening sequence was passive as the mother spent 4–6 hours watching television. There were many consequences, especially in taking care of household chores: the kitchen sink was filled to the brim with dirty dishes. In this family, the sequence map was used to plan and schedule home cleaning. Family members were given their own areas of responsibility, and the cleaning of the apartment was divided into smaller tasks, which made it easier to implement the new practice. The Jameson mother described the change as follows:

> The sequence map both reminds and entails responsibility for cleaning the apartment. If some tasks are scheduled on the sequence map, it is easier to do the cleaning. (Audio recording, Jameson mother, the 21st home visit of the family worker)

In the Robinson family, the children (the 9th grade pupils at comprehensive school) spent a lot of time on the computer, for example, for coding, making graphics and maintaining contact with friends. After sporting activities, they typically spent several hours on the computer. The Robinson mother could not keep an eye on the use of the computer because she had to go to bed early, and therefore the children had the opportunity to create their own rules. Late bedtimes caused wake-up difficulties and delays in getting to school. During home visits, family workers and children planned a new schedule that supported school attendance. A family worker's note describes how working with the sequence map started with the children:

> I thought that we could schedule just this week. Kind of an experiment week. We will try to schedule when you wake up, go to bed and leave for school. After one week we can discuss how you felt with this new schedule. (Audio recording, the 2nd home visit of a family worker)

The interference in the challenges of daily life was difficult even though the families themselves identified the problems. However, well-timed intervention pushed the families towards the mastery of daily life. In the "Getting Grip" project,

the sequence map proved to be a promising tool for supporting the structure of everyday life. The project showed multiple applications of the map. Families managed to limit television watching and to structure new sequences with the help of the map. The case of the Robinson family raises questions about the relationship between the parent, child and technology. Technology seems to be a tool that organizes this relationship in a new way, particularly in the setting of boundaries for children. The analysis of family data revealed individual choices and numerous options that the sequence map provides for organizing the changing everyday life. It makes everyday life and the use of time visible (cf. Kupiainen and Holmberg 2011).

The other two projects – the "Net" and the "Service revolution" project – enabled us to examine the progress digitalization after the "Getting Grip" project. Between these projects, digital environments and platforms had developed fast, and people become used to utilizing different devices. Our studies indicate that digitalization structures the future in an important way and may include permanent changes in daily life.

In the analyses of the second study, the "Net", the permeability of digitalization came clearly out. The use of digital devices and social media infiltrated the actions of everyday life of young people who were the target group of the study. The sequence map was used as a method when analysing their daily life management. The results showed that this method was useful and able to bring up matters whose observation could have otherwise been difficult. In addition to the facilitation of daily matters in general, the sequence map helped the handling of financial issues. Furthermore, it facilitated the discussion about the rhythm of the day. Some of the interviewees did not have a regular day rhythm or had an inflexible day rhythm, which made it difficult to implement changes.

An excerpt from a young lady, called Tina, illustrates the use of digital applications during an ordinary day and shows how intense and even addictive this behaviour can be. The quotation shows the challenge of multitasking that the continuous use of digital devices can cause:

> ... At the same time, you can look at the mobile phone and look at something else, too; a little bit like ADHD that you can eat at the same time and see if there is something new on Facebook … That is a little bit addictive. (Interview, Tina 13.3.2014, 1/6 page 6)

Also the sequence map filled in by a young man, called Peter, illustrates how digitalization is built in the everyday life of young people: it is present during the whole day via a range of devices. The map describes 1 day (the 9 January 2014) in a follow-up period of 1 week (Table 5.2). In the case of Peter, everyday life arrangements were under control, but the rhythm of everyday life was inflexible. When seeking a job, Peter said that he wanted to work only during the daytime, 08:00–16:00. He wanted to keep evenings and weekends free.

The third study, in the framework of the "Service revolution" project, is also concerned on the use of digital media and the daily life management of students. The sequence map was again tested as a tool to concretize their daily rhythms. In the analysis, everyday life mastering styles and challenges were identified. Also, the

Table 5.2 Peter's sequence map describing 1 day in a follow-up period of 1 week

	Thursday
08:15	Waking up, **being on the computer**
08:30	Breakfast, **watching TV**
09:00	Taking the dog out
09:40	Morning routines
10:00	**Being on the computer, watching TV**
11:00	Going to the "Net" project office
12:00	Meeting the coach at the "Net" project office
13:20	At shopping centre
13:45	Lunch
15:00	Taking the dog out
15:35	**Being on the computer** with the dog
16:10	Laundry washing, cleaning
17:00	Eating, **watching TV** with the dog
19:00	Taking the dog out
20:30	Evening meal, **watching TV, being on the computer** with the dog
23:35	Evening routines
00:10	Going to sleep

different ways of using digital media and the use of time were found in the analysis. It turned out that the application of digital devices and social media varies individually. One of the interviewees restricted the use of social media tightly and did not want to share opinions on the Internet; another used digital devices mainly for gaming. For some students, social media was just for contacting friends.

The interviews of this study revealed that the students utilize a wide range of digital tools. Everyone had a mobile phone and email. Some interviewees were immigrants, and for them it was important to read news in one's own language. They used the Internet at least via the mobile phone: reading news from the home country was considered important even though the person did not have a computer. Social media like Skype, WhatsApp or Facebook were used to chat with friends and family members. Through Skype, it is easy to keep contact with friends all over the world. Facebook was regarded as important for keeping up-to-date with the news of friends. Also, groups and private messaging (Messenger) were utilized on Facebook. Some people said that they do not wish to share their own affairs on Facebook but consider it interesting to follow other people. Instagram was popular when sharing photographs with others. Playing games on the Internet was important to four of the six interviewees; one of them belonged to a gaming community. Two interviewees did not use digital devices at all, except email. One of them explained that her husband did not allow her to use social media. She spent her time by watching television. Another woman told that it was her own principle not to join Twitter or Instagram. This can be caused by the immigrants' culture.

The interviewees of this study spent 3 to 6 hours a day on social media. An advantage of the 24/7 society is that it helps people to keep in contact with others regardless of the time of the day. The challenge is how to control the use of the time spent on social media or with other digital tools. Checking messages all the time disturbs concentration, and using social media keeps young people awake – so, some of them get too little sleep. However, in general, the interviewees of this study experienced social media as a factor that contributes positively to the quality of life. As one interviewee put it: "social media platforms are a big part of everyday life".

There are also other opposite factors that characterize life in the digital era. Everyday life is individual but at the same time affected by social factors. Life is global but at the same time local. People have to cope with the complexity caused by these factors. In the following, we use them to summarize the challenges of the digitalizing everyday life in a four-field figure (Fig. 5.2). The figure is based on the interviews of both the "Net" project and the "Service revolution" project. Comments of four interviewees illustrate the fields: the case of Mike is from the "Net" and the cases of Anna, Ester and Andrew from the "Service revolution" project. While all of these interviewees have some linkage to all fields, their focus varies individually regarding their activities and opinions in relation to digital devices and social media.

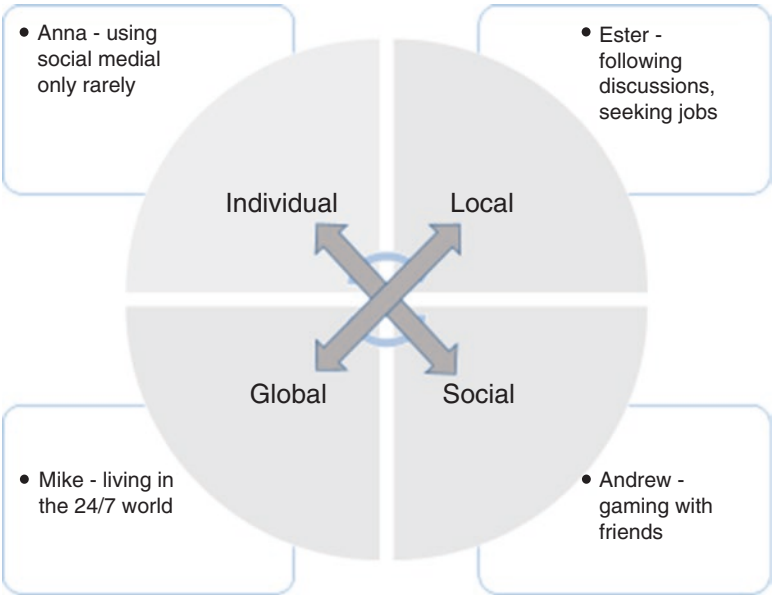

Fig. 5.2 Dimensions of digitalizing everyday life

On the dimension "social vs. individual", Andrew is an example of the social focus. Gaming with friends is his central interest as the following excerpt illustrates:

> Every day I'm gaming on the computer for maybe two hours and then I prepare food. In the evening, at 8 or 9 o'clock I am chatting on Skype… I have about 50 friends all over the world. We talk about everything. (Interview, Andrew 22.4.2015, page 9)

An individual way to use digital devices is illustrated by Anna:

> The interviewer: "What kind of role does the social media have in your life?"
> Anna: "I use Facebook a little, but I do not have Instagram or Twitter. I have not left for that world yet… I am not that kind of a person who likes to share my own matters there." (Interview, Anna 17.4.2015, page 6)

On the "local vs. global" dimension, Ester is a representative of the former. She uses the Internet for reading blogs, for following the social media channels and for job seeking.

> The interviewer: "How much do you spend time with digital devices per day?"
> Ester: "Well, I read a lot of blogs and follow the channels of social media actively… First in the morning, I turn on the computer when I am having breakfast… and then all day long. In the evening, I turn off the computer. Easily, a couple of hours per day, sometimes even more. If I am searching for a job, which can even take three hours per day." (Interview, Ester 16.4.2015, page 7)

The latter, the global style of living in the 24/7 world, was natural for Mike. He used to draw pictures interactively on the Internet. His dream was to study graphic design and to become a professional in that field. An example of his everyday life arrangements is the following:

> The coach: "So, you have mentioned everything that happened yesterday and what you did?"
> Mike: "Well, there's something else, too. Not so surprising events … but also my own special hobby… Wait, about eleven - twelve o'clock in the evening when you are drawing, and you can visit some specific Internet pages, you can draw on a kind of "drawing table" that other users can draw on as well."
> The coach: "Interactively?"
> Mike: "Yes, interactively. So, you can draw live and it is fun to draw with others and chat with them… So, I have these distant friends, chatting friends, more at night."
> The coach: "They can be from anywhere?"
> Mike: "Yes, abroad even, and it annoys me that there are different time zones because they live on another side of the globe. So, they are drawing during the day and it is because they are my good friends it annoys me that I have to go to sleep and can chat with them for only a couple of hours… I am thinking a little bit globally, so I have globalized. This is my way to react to these matters." (Interview, Mike 7.3.2014, 1/6, pages 7–8)

5.5 Concluding Discussion

In this chapter, we have reported a study on the conduct of everyday life of families and young people in the digitalized world. The study is based on three different projects carried out during different periods in the last decade. The central interest of the study was the contradictions that emerge in the digitalized daily life. Critical psychology (e.g. Schraube and Hojholt 2016) and sociocultural theory (Vygotsky 1978) form its conceptual background and the starting point for the analytical tools applied. The use of the sequence map combines our empirical cases. The map was both a method for data gathering and a tool for analysing data (in the "Net" project) (see also Newman and Holzman 1993; Vygotsky 1997).

Our study examines the consequences of digitalization on both the societal and the individual level. From the societal point of view, the expansion of telecommunications has changed environments, and individuals maintain their global connections all the time through the Internet (Chaney 2002). That is why the boundaries of locality are arbitrary even though everyday life is intrinsically local. Individual decision-making is needed, and at the same time, the consideration of the social norms is expected. It is possible to live a 24/7 life if the person is not tightly connected with particular working or school hours, but in order to keep the structure of everyday life flexible, management skills are needed. Digital devices also demand skills for using them, and the importance of these skills grows as all the more services are on the Internet.

On the individual level, our empirical study reveals that digitalized daily life is multidimensional and partly contradictory. On the one hand, the new innovations and solutions are linked to digitalization demand of users' activity. On the other hand, the daily life of people can be passive because of excessive use of screens. For the young people, digitalization is infiltrated in everyday actions – a phenomenon that can be called the permeability of digitalization. The young generations, "Digi natives", live naturally in a 24/7 society. They are capable users of digital devices since their childhood, which creates differences between generations. A specific challenge among young generations is controlling the excessive use of digital devices. As the digital devices and applications are so captivating, young people need support at home in organizing their daily activities and rhythm.

An important result in our study is that individuals can be supported in conducting everyday life among changes. Our examples about the use of the sequence map as a tool for constructing and keeping up the daily structure are promising. The map visualized daily activities and concretized daily life challenges and future plans in the case of both families and young people (see also Kupiainen and Holmberg 2011; Sekki 2018). Our intervention shows that it is possible to support too drifting daily rhythm as well as too restricted everyday activities by means of culturally mediated socio-material artefacts.

Our study revealed that digitalization is not a separate part of daily life but intertwined with everyday actions. This means that in order to understand the impact of digitalization on people's lives, it also should be studied intertwined in daily actions. The sequence structure serves as a promising conceptual and methodological tool for that purpose and facilitates understanding of the complexity of activities and daily life entity (see also Hasu et al. 2018).

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Chapter 6
Institutional Logics in Service Ecosystems: An Analysis of Immigration and Social Inclusion

Maria Taivalsaari Røhnebæk, Marit Engen, and Trude Hella Eide

Abstract This chapter explores the applicability of a service ecosystem perspective in human-centered service contexts. The notion of service ecosystems springs from the literature on service-dominant logic (S-D logic), which has contributed to the rethinking of service exchange as a value creation processes rather than as production of output. It serves as a framework for studying systems of service systems and is relevant for capturing the complexity of value creation in certain human-centered service contexts. We address this complexity by integrating the service ecosystem perspective with institutional logics theory. This allows for an analysis of how negotiations of different outlooks, values, and beliefs influence the activation of resources across service systems and ultimately the ability to cocreate value. The chapter is based on data from the Norwegian "Introduction Program," which is a public service offered to newly arrived refugees and immigrants granted asylum. As such, the chapter deals with complex service systems that provide services for users in vulnerable and marginalized positions. In this context, the solutions to problems and areas for improvements cannot be found in the digitalization of service processes. Thus, the chapter brings attention to service areas in which the impact of the digitalization of service processes is limited, or mainly indirect.

Keywords Service ecosystems · Institutional logics · Resource integration · Social inclusion

M. T. Røhnebæk (✉)
Inland Norway University of Applied Sciences, Elverum, Norway
e-mail: maria.rohnebak@inn.no

M. Engen
Inland Norway University of Applied Sciences, Elverum, Norway

Karlstad University, Karlstad, Sweden
e-mail: marit.engen@inn.no

T. H. Eide
Eastern Norway Research Institute, Lillehammer, Norway
e-mail: trude.eide@ostforsk.no

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6.1 Introduction

2015 marked the start of Europe's refugee crisis. The hundreds of thousands of people that fled across the Mediterranean Sea gave rise to political debate and challenged integration across European countries. In Norway, the stream of immigrants led to increased pressure on the public service systems responsible for the settlement of and educational programs for newly arrived immigrants. The need for better integration services, with enhanced capacities to support social and labor market inclusion, became an issue of high concern on the political agenda. This was linked to needs for the mobilization of various resources in the society, in both the labor market and civil sector. We intend to explore how the service ecosystem perspective, developed in the literature on service-dominant logic (S-D logic), can shed light on the public service systems' ability to mobilize a broader set of resources.

S-D logic was introduced as a perspective to challenge the economic paradigm of goods-dominant logic (G-D logic). The latter emphasizes manufactured output and value-in-exchange, as opposed to seeing value as being cocreated, derived, and assessed in use (Vargo and Lusch 2004, 2008). Over the last decade, the S-D logic perspective has been revised, elaborated upon, and extended (e.g., Vargo and Akaka 2009; Vargo and Lusch 2008, 2016). The development has led to the introduction of a service ecosystem perspective (e.g., Vargo et al. 2010; Vargo et al. 2008).

The service ecosystem perspective moves beyond a more conventional understanding of value (co)creation as resulting from dyadic relations between firms and customers (or providers and beneficiaries) (Vargo and Lusch 2016). Following the service ecosystem reasoning, such dyadic relations are embedded in broader social structures, in which multiple actors take part in value cocreation through resource integration (Edvardsson et al. 2011). Vargo and Lusch (2016) hold that this extended model of value cocreation and resource integration relies on insights concerning the workings of institutions, and they advocate the relevance of institutional theory. In this chapter, the institutional logics perspective is presented as one relevant body of literature within institutional theory (Edvardsson et al. 2014; Vargo and Lusch 2016). We use institutional logics theory (Friedland and Alford 1991; Thornton et al. 2012) as a lens to analyze service ecosystems dynamics in a noncommercial service context.

Our study is set within services provided for newly arrived immigrants granted residency in Norwegian municipalities, within the so-called Introduction Program. The aim of these services is to enhance opportunities for newly arrived immigrants to participate in working and social life and to increase their financial independence. The municipalities are responsible for providing these services, but they are clearly dependent on the interactions and contributions of a range of actors to realize aims of inclusion and participation. This system of interacting actors is what we refer to as a service ecosystem, and the municipal units that are legally responsible for providing these services are seen as the "focal service system" in our study.

In S-D logic, a service ecosystem is defined as "relatively self-contained self-adjusting system of resource-integrating actors connected by shared institutional logics and value creation through service exchange" (Vargo and Akaka 2012, p. 207). Such service ecosystems can be well integrated, stable, and harmonious, but they may also be loosely integrated, fragile, and marked by conflicts and tensions. Various studies show that tensions and conflicts between actors in service ecosystems may affect resource integration and the ability to cocreate value and that such conflicts can function either as a positive or a negative force. Skålén et al. (2015) show how positive transformations of service systems can spring from conflicts between key actors within a system, and Siltaloppi et al. (2016) see actors' positioning between conflicting institutions (i.e., rules, norms, symbols) as a driving force for creativity, innovation, and the restructuring of service systems. Similarly, Baron et al. (2017) map the different institutions (norms, rules, practices, meanings, and symbols) that characterize actors within a service ecosystem and conclude that innovations spring from conflicts between actors and the different institutions.

We take a somewhat different approach in this chapter, which is concerned with the maintenance and expansion of service ecosystems rather than restructuration. More precisely, we focus on how the maintenance and expansion of service ecosystems requires the ability to negotiate and balance between different institutional logics. The aim of this chapter is thus twofold: to explore how different institutional logics influence resource integration in service ecosystems and to explore how this in turn affects the service's ability to facilitate social inclusion of refugee immigrants. With this focus, we respond to calls for service research on refugee immigration from a service ecosystem perspective (Fitzerwalder 2017).

The chapter is further structured as follows: we first present our theoretical framework, which integrates the service ecosystem perspective with institutional logics theory. We then account for the research context and outline the methods used and the data gathered. Finally, we present and discuss the empirical findings and end with a short conclusion.

6.2 Theoretical Framework

This section draws on S-D logic as a perspective for studying value cocreation processes in service ecosystems (Maglio and Spohrer 2008; Vargo and Lusch 2016; Vargo et al. 2008). The first subsection briefly presents value, value cocreation, and resource integration in service ecosystems. Institutional logics theory is subsequently introduced as a perspective to broaden and illuminate the potentially complex processes of value cocreation and resource integration.

6.2.1 *Value Cocreation and Resource Integration in Service Ecosystems*

S-D logic defines service as the application of competences (knowledge and skills) by one entity for the benefit of another (Vargo and Lusch 2004, 2008). This conceptualization focuses on an understanding of service (singular), not services (plural). Hence, it moves beyond the traditional focus of service research—intangible outputs of firms—toward a perspective for understanding value creation. S-D logic argues that the creation of value commonly takes place through integrating tangible resources (e.g., raw materials and tools) and intangible resources (e.g., knowledge and skills). The resource integration process thus concerns the actors' efforts to combine and use resources to create intended value (Vargo and Lusch 2008). A central premise is that all actors are viewed as potential resource integrators. Resources are also viewed as "becoming" (Chandler and Vargo 2011; Vargo and Lusch 2004), implying that they possess potential value which only can be realized by actors during the resource integration processes (Skålén et al. 2015).

The role of organizations is to support and assist customers' (users') value creation processes rather than to produce and deliver output (Grönroos and Voima 2013). Furthermore, S-D logic holds that value is being cocreated through the combined efforts of firms, employees, customers, stakeholders, government agencies, and other related entities. Accordingly, value cocreation is not viewed as a dyadic relationship, but as a multi-actor phenomenon, where actors cocreate value by using and combining resources in different ways (Vargo and Lusch 2016).

The ways in which multiple actors collaborate and act as resource integrators can be captured through the perspective of service ecosystems (Vargo et al. 2016), which is presented as a framework for studying systems of service systems. The service system is understood as an arrangement of resources (e.g., people, technology, and information) connected to other systems by value propositions (Maglio and Spohrer 2008; Vargo et al. 2008). The service ecosystem draws attention to the interactions within and between service systems and to the social contexts that frame value cocreation (Aal et al. 2016; Edvardsson et al. 2011).

Following the basics of structuration theory (Giddens 1984), S-D logic considers service ecosystems as embedded in social systems consisting of social structures that both enable and constrain actions (Edvardsson et al. 2011; Åkesson et al. 2016). This resonates with institutional logics theory, which suggests that the society consists of an interinstitutional system comprised of a set of macro-level institutional orders (Friedland and Alford 1991; Thornton et al. 2012). These institutional orders frame institutional logics at the meso-level, which in turn constrain and enable microlevel action. In the following subsection, we elaborate the theory on institutional logics in more detail and indicate the relevance of this theory for understanding interactions in service ecosystems.

6.2.2 *Institutional Logics Theory*

The perspective of institutional logics is both a metatheory and a method of analysis, anchored in institutional theory (Thornton and Ocasio 2008). The origin of this perspective derives from Friedland and Alford (1991), who perceive society as an interinstitutional system. In the capitalist Western societies, this system is constituted around five basic macro-institutions, or institutional orders: the capitalist market, the bureaucratic state, democracy, the nuclear family, and the Christian religion. In revisions and further developments of the perspective, the institutional orders have been more clearly developed as ideal types and analytical categories, detached from specific institutional sectors. In the revised form, the interinstitutional system consists of family, community, religion, state, market, profession, and corporation (Thornton et al. 2012).

The institutional orders are symbolic systems that enable, constrain, and legitimize individual and organizational behavior (Thornton and Ocasio 1999; Thornton et al. 2012). Correspondingly, institutional logics can be defined as "the socially constructed, historical patterns of cultural symbols and material practices including assumptions, values, and beliefs, by which individuals and organizations provide meaning to their daily activity, organize time and space, and reproduce their lives and experiences" (Thornton et al. 2012, p. 2).

In other words, institutional logics include various underlying assumptions, which constitute frameworks for valid and invalid forms of reasoning within specific contexts. The boundaries of different logics are not clear-cut; they may overlap and coexist, but articulating various logics gives a framework for identifying how practices and reasoning are deemed legitimate or illegitimate depending on the context. It is important to note that different industries, sectors, or organizations do not enact one kind of institutional logic, but rather multiple. Still, some logics and institutional orders tend to be more dominating than others, depending on specific organizational contexts.

The institutional logics perspective marks a break from the dominant focus on isomorphism in neo-institutional theory (DiMaggio and Powell 1983). Research associated with institutional isomorphism addresses how organizations become increasingly similar through structural alignments, caused by conditions in the institutional environment. The weak spot of this research stream lies in the poor conception of the role of agency and in the tendency to mainly focus on institutional preservation rather than change. The institutional logics perspective incorporates a more explicit conceptualization of agency with the notion of "embedded agency," which refers to how the interests, identities, values, and assumptions of individuals and organizations are embedded within prevailing institutional logics (Thornton et al. 2012). In this way, the perspective stresses the interconnections between the individual, organizational, and macro-levels.

Moreover, the perspective was developed as an approach to explain institutional change: opportunities for change were found in actors' positioning at the crossroads of contradictory or incompatible logics (Friedland and Alford 1991). Institutional

logics theory has primarily been applied to capture transformations at the organizational field level. Research has largely focused on identifying dominant logics and depicting changes in these logics in industries or fields (Edvardsson et al. 2014; Lounsbury 2002; Thornton and Ocasio 1999). However, the institutional logics perspective can also be used to shed light on the implications of the coexistence of competing logics (Jay 2012; Reay and Hinings 2009; Saz-Carranza and Longo 2012; Skelcher and Smith 2015; van den Broek et al. 2014). We consider insights from the latter approach useful for gaining enhanced understandings of resource integration and value cocreation in service ecosystems.

As described above, the idea of service ecosystems implies that actors from diverse sectors and organizational contexts act as resource integrators to cocreate value. This in turn means that service ecosystems are based in multiple institutional logics, and insights on the making and maintenance of such systems require insights on how competing institutional logics are contested and negotiated. We aim to demonstrate and discuss the relevance of this approach in the remaining part of the paper, by exploring "introduction services" for refugee immigrants in Norway from a service ecosystem perspective.

6.3 Research Context

6.3.1 The Principles of the "Introduction Program"

Our empirical research was carried out in services aimed at ensuring integration and social inclusion for immigrants who arrived in Norway as refugees or asylum seekers. Refugees and immigrants granted asylum in Norway have the right and indeed are obliged to participate in an "Introduction Program" offered by the municipalities. Access to this program also includes reunited family members. The program is sanctioned in the "Introduction Act" and it was first implemented in 2004.

The program is a full-time work, 5 days per week, and consists of 600 hours of Norwegian language training and social science classes on Norwegian society, such as citizens' rights and obligations. It is provided free of charge within the first 3 years after settlement. Participants are entitled to introduction benefits granted as standard payments, with reductions in the case of invalid absence. The aim of the program is to ensure that newly arrived immigrants familiarize themselves with Norwegian culture and society, acquire basic Norwegian language skills, and qualify for employment or further studies. The purpose of the program is thus to enhance opportunities for newly arrived immigrants to participate in working and social life and to promote their financial independence.

6.3.2 Variations in the Program

The "Introduction Program" is the most central integration measure administered by Norwegian authorities. The program is a rather costly investment, expected to pay off in the long run in terms of anticipated reduction of social inequalities and released pressure on public welfare schemes. Other Scandinavian countries apply similar models, which all reflect the Scandinavian welfare state model based on a social democratic ideology.

Even though the basic model of the "Introduction Program" is similar across Norway, the municipalities have each developed diverse models for implementing it. We therefore examine the models as constructions of different service ecosystems. An important difference between them is the "success" of the various models. A nationwide goal set for the programs is for 70% of all participants to be employed or enrolled in education 1 year after completing the program. This target was set in 2010 but has not yet been reached nationally in aggregated results. The results vary considerably across counties and municipalities, however, and studies show that these varied results cannot be explained by local labor market conditions nor by participants' characteristics (Lillegård and Seierstad 2013; Tronstad 2015). This suggests that the results are linked to different local solutions in the organization, design, and execution of the programs. However, further tests show that the differences do not concern formal organizational models (Tronstad 2015). Rather, explanations can be found in the ways in which government bodies mutually collaborate and coordinate resources, as well as in their ability to involve local employers and civil sector actors and collaborate with them (Røhnebæk and Eide 2016; Tronstad 2015). Hence, the service ecosystem perspective is highly relevant for obtaining increased understanding of value cocreation in this research context.

6.4 Methods

6.4.1 Research Design

The paper is based on a multiple case study of four municipalities in Norway. The case study is described as a research strategy that "focuses on understanding the dynamics present within single settings" (Eisenhardt 1989, p. 534). It offers depth and comprehensiveness for understanding (Yin 2009), which in our study context is more important than statistical generalization. The four municipalities are set in midsize cities (by Norwegian standards) with around 30,000 inhabitants and are all located in the same inland region characterized by agriculture and forestry, with a labor market dominated by public sector employment. The data thus enable comparisons between the cases, the results of which can be considered more robust

and representative compared to a single-case study (Eisenhardt 1999; Yin 2009). The study is based on "process data" (Langley 1999), which means that it follows ongoing developments in organizational settings.

6.4.2 Data Collection and Data Material

The data consist of interviews and document studies.

Interviews were conducted in two phases. In the first phase, the aim was to map the service ecosystems in terms of the organizational models and collaborative structures of the services in the four municipalities. This phase consisted of interviews with 41 informants. Of these, 17 were managers in the focal service system, i.e., the public service units. Organizational documents such as organizational maps, procedures, and formal collaborative agreements were also studied to gain insight on the focal service system. Moreover, interviews were conducted to capture details of specific collaborative arrangements. For this purpose, we carried out 13 interviews with frontline employees in different positions and 11 interviews with external collaborating actors (volunteer organizations and local employers).

In the second phase, data collection focused on the municipalities' efforts to strengthen their collaborative arrangements or to develop new ones with external actors, which we respectively refer to as maintenance or expansion of the service ecosystem. In this phase, we interviewed 49 informants to gain insights on experiences with the collaborative arrangements. Informants in this phase were individuals directly involved in collaboration at the service level—mainly frontline employees and representatives of collaborating external actors (local employers).

Altogether, we interviewed 90 persons in the study (some interviews were arranged as small group interviews with 2–3 informants). The first phase of data collection was conducted in 2015 and the second phase in 2017. The interviews were carried out face-to-face, with one or two researchers. The interviews were recorded and then transcribed.

6.4.3 Data Analysis

The analysis of the data material was conducted in two steps:

The first step consisted of mapping the profile of the service ecosystem in each case, i.e., each municipality. The profiles were outlined based on the internal documents of the municipalities and on interviews with leaders and managers at each unit of the focal service system. The analysis revealed that each of the four municipalities had developed different organizational and collaborative models for handling the "Introduction Program." As such, the service ecosystems were arranged differently (see Table 6.1).

Table 6.1 Overview of service systems and the identified institutional logics

	Case 1	Case 2	Case 3	Case 4
Organizational models of the focal systems	NAV is responsible for the program. The adult education unit "delivers" the social studies and language classes on behalf of NAV	The adult education unit is responsible for the program. Formalized agreements ensure structured collaboration between the adult education unit and NAV	Responsibility for the program is shared between NAV and the adult education unit. Settlement issues are handled by a separate service center	Responsibility for the program is shared between a refugee service unit and the adult education unit. There are weak collaborative links with NAV
Service ecosystem: interactions with external actors	Volunteer sector: Cooperation between the adult education unit and a volunteer center on activities within and beyond school hours	Volunteer sector: Collaboration with a volunteer center offering help for homework and other activities and support beyond school hours	Volunteer sector: Collaboration with the Red Cross on activities within and beyond school hours and also collaboration with the Norwegian Trekking Association and informal volunteer groups on recreation activities	Volunteer sector: Collaboration with the Red Cross on help for homework and some extracurricular activities. Collaboration with informal volunteer groups on recreation activities
	Employers: Collaboration with a wide range of public and private sector employers on practical language training and ongoing development of more systematic collaboration with employers on vocational training, in combination with practical language training	Employers: Systematic and extensive collaboration with private and public sector employers on vocational training and practical language training	Employers: Systematic collaboration with private and public sector employers on vocational training and practical language training	Employers: Limited access and capacity to collaborate with employers on vocational training and practical language training
Dominant logics	Work first	Place then train	Place then train	Work first
	Place then train	Human capital	Citizenship	Human capital
		Protection		Protection
				Citizenship

The second step consisted of a closer reading of the data material; here, the aim was to detect the dynamics and tensions embedded in the different systems. The structuring and analysis of the interview material followed phenomenological principles. As such, we were concerned with understanding how actors in the service ecosystem perceived integration and social inclusion processes. This implied extraction of condensed meaning from the different interviews that were subsequently sorted in "themes" (Kvale and Brinkmann 2009). The institutional logics lens was used as an analytical framework to make sense of the themes—in other words, the themes were explored as expressions of different logics. In sum, this step involved both identification of the logics at play and the dynamics and tensions between them.

6.5 Empirical Findings

This section presents the empirical findings of our study, structured in three subsections. The first subsection presents an overview of how we perceive the service ecosystem in each of the municipalities; we also describe the institutional logics that we found most dominant in each case. The second section describes the institutional logics that we identified among the public service actors providing the "Introduction Program" (the focal service system) in the four municipalities. The third section gives a more detailed description of the different institutional logics in two selected cases; here, we also compare and discuss the effects of the interplay of different logics on the broader service ecosystem. The two cases that we analyze in depth were selected based on their suitability for demonstrating the relevance of linking the service ecosystem perspective and the institutional logics theory.

6.5.1 The Models of the Focal Service Systems

The "Introduction Program" is organized and set up differently in each Norwegian municipality, but the same governmental actors are generally involved: the adult education units (often referred to as learning centers), the employment and welfare services (known under the acronym NAV), and the refugee services. The latter has in many cases been incorporated with the other units—i.e., with NAV or the adult education unit—but they can also function as an independent service. Housing offices or service centers may also be involved in housing and practical settlement issues. In our study, these governmental actors, which are formally responsible for providing the "Introduction Program," constitute the focal service system. Each of the municipalities has chosen a different organizational model and collaborative structure for the focal service they provide.

The models chosen for each focal service system are presented in Table 6.1, and relations to actors in a broader service ecosystem are indicated. We also identify the institutional logics that we consider most dominant in the different cases. The logics are more thoroughly described below.

6.5.2 A Categorization of the Institutional Logics

The analysis identified five competing logics that underlie the "Introduction Program," as shown in Table 6.1. These competing logics reflect the shifts, dilemmas, and ambiguities of immigrant integration and social policies.

First, there is the "work first logic" which has gained a foothold along with broader changes in social policies toward activation and conditionality (Djuve 2011). The "work first" line of reasoning holds that any job is better than none, i.e., it stresses the integration of immigrants in the labor market. As a middle manager in the employment and welfare services (NAV) explained, "We try with this model to emphasize work from day one—from the first day of settlement."

Second, there is the "human capital logic" which stresses the development of skills through training and education that will enable people to find a suitable job. This logic sets the main focus on education, as illustrated by a quote from a frontline employee in the adult education services: "They focus more on the practical stuff at NAV, while we focus on school and teaching."

Third, there is the "place then train logic" which emphasizes the value of providing language training through work practice at an early stage. This logic is linked to the policy pressure to develop more work-aimed programs and combines two lines of reasoning: (1) involvement in the Norwegian labor market at an early stage after settlement is seen as beneficial and is expected to increase chances of employment after the program; (2) language training in the work place is considered to be more effective than traditional classroom learning, especially for people with minimal education. A middle manager in the refugee services described it as follows: "It's about disagreements concerning at what time participants are ready for internships with employers, whether you first have to learn Norwegian and then you take part in work practice, or whether it might be possible to do this the other way around."

Fourth, there is the "protection logic" which emphasizes the vulnerable situation of many newly settled immigrants. In line with this logic, refugee immigrants need time to settle down in a new place, as they often have had traumatic experiences they must deal with. Pressure to take part in vocational or language training in work places, at an early stage after settlement, is adverse in this reasoning. The following quote from a frontline employee in the adult education services illuminates the essence of this logic: "because it takes time to settle."

Fifth, a final marginal logic is the "citizenship logic." This logic challenges the uniform focus on the importance of work and addresses the fact that employment is not realistic for everyone. Following this logic, there is a need for integration measures that stimulate social inclusion and citizenship more broadly than what can be achieved merely through work inclusion. As expressed by a manager at NAV, "The reason for following the chosen model is based on an idea that refugees should be treated as any other citizen, they need to relate to public services in the same way as other citizens."

The logics compete in different ways and to differing degrees within the focal service systems of each case. Differences in accentuated and downplayed logics are to some extent linked to variations in the different organizational models in the

municipalities. Furthermore, we found that the dynamics of different and at times competing logics in the focal service system affect the municipalities' maintenance and expansion of a broader service ecosystem, which covers the vocational training agencies, employers, and civil sector actors. These actors also enact various logics that may be more or less compatible with the logics of the involved governmental agencies.

In the next section, we present details of our findings from two selected cases that illustrate how the existence and negotiations of different logics influence the dynamics of the service ecosystem.

6.5.3 The Institutional Logics at Play in Cases 2 and 3

6.5.3.1 Case 2: "Place Then Train" and "Human Capital"

In case 2, the "Introduction Program" was placed at the adult education center, which was integrated with the refugee services. This case accentuates most clearly the "place then train logic." The refugee services had previously been an independent service unit—and fully integrating this previously external unit had taken many years, according to informants at the center. The program advisors and teachers represented different and strong opinions regarding how to best run the program. For example, they disagreed on which laws should primarily guide the "Introduction Program" and ultimately the objectives of the program. The teachers adhered to the "Education Act," and the program advisors adhered to the "Introduction Act." This resulted in disagreements regarding when the participants were ready for internships and work training, which was linked to different opinions on how best to learn the language:

> They [the teachers at the adult education center] were very concerned with the importance of learning Norwegian correctly. For instance, if the participants had internships they found that they had to start over when they returned to the classroom because they learned incorrect Norwegian through their work placements. (Middle manager, refugee services)

The quote highlights how the employees in the different departments adhered to different logics, which centered on different opinions on the use of internships and work practice. The "place then train logic" was most active in the refugee services, while the teachers followed a mix of the "protection logic" and the "human capital logic." However, employees of the different departments eventually started to reach more concurrent views on how the program should be carried out. This happened as a result of lengthy negotiations and various incentives to improve collaborative relations. Moreover, dividing the program into work-directed and school-directed classes, depending on the participants' backgrounds and future plans, contributed to this reconciliation. The result was a program that actively enacted the "place then train" logic and involved a wide range of employers in resource integration.

The employment and welfare services (i.e., NAV) appeared to have a more sidelined role in the actual program in this case. However, continuing interaction and

meetings based on formal collaborative agreements between NAV and the adult education center seemed to ensure that NAV took part as a central service system in the ecosystem. Yet, these collaborative links also required negotiations and gradual adjustments. The manager of the employment and welfare services explained that they had gradually reached mutual understandings of the programs' objective:

> Now we have reached mutual understandings because the leader of the learning center has been attentive. Teaching Norwegian is part of the "Introduction program," but the objective is financial independence—Norwegian skills as such do not provide employment. (Manager, NAV)

NAV accentuated the "work first logic" but found this to be aligned with the "place then train logic" most clearly pursued by the adult education center. This enabled the two units to develop continuity in the training and qualification of participants who required access to measures and benefits from NAV after the program period. NAV was involved in the early stage, when the participants started the "Introduction Program"—this allowed for "new ways of thinking regarding continuity in training and qualification," as pointed out by the manager of the refugee services.

In this case, a local volunteer center was also found to contribute to the "Introduction Program." Some activities conducted by nongovernmental organizations (NGOs) were integrated in the program, but the adult education center also initiated contacts with NGOs that provided activities beyond the regular program.

To summarize, the "place then train logic" had come to dominate the development of the "Introduction Program" in case 2. The "protection and human capital logics" were also present but somewhat downplayed—or rather, the "human capital logic" had become ingrained with the "place then train logic." Although NAV enacted the "work first logic" more strongly, this converged with the logics accentuated at the adult education center. Thus, it seems that, in this case, negotiating competing logics enabled the municipality to make and maintain a service ecosystem that engaged various actors as resource integrators.

6.5.3.2 Case 3: "Citizenship" and "Place Then Train"

In case 3, the municipality placed the "Introduction Program" within NAV; their organizational model was thus similar to that in case 1. However, whereas NAV was entirely responsible for the program in case 1, in case 3 it shared this responsibility with the adult education center. The adult education center was responsible for providing Norwegian language and social science classes, and NAV was responsible for the other parts of the program, including general follow-up, vocational training, and administering introduction benefits. In addition, a municipal service center was responsible for housing and other settlement issues.

Even though three different units shared responsibility for the program, there were no formal agreements that regulated the relations between the units. This seemed to create a fragmented model in which responsibilities had not been clearly defined. In this regard, the model in case 3 clearly differs from that in case 2.

However, this model also enacted a specific logic—namely, "citizenship logic." The manager of the adult education center explained the reasoning underpinning the model as follows:

> The model follows this basic idea that refugee settlement concerns the whole municipality, it is not just the responsibility of one specific agency or unit. Refugees are settled in the community in the same way as any other citizen, and they relate to public services like others. (Manager, adult education center)

The NAV manager also justified the model using similar terms: "The reason for following the chosen model is based on the idea that refugees should be treated as any other citizen, they need to relate to public services in the same way as other citizens."

By following the citizenship logic, the chosen model made sense because it entails ideas of social inclusion and participation more broadly, compared to logics that merely focus on work inclusion. The model itself was seen to enable independence and autonomy by encouraging refugees to relate to the functioning of the Norwegian welfare state model in the same way as other citizens. While the logic underpinning the model was accepted by the units involved in the program, the actors also questioned the validity of the model: "The chosen model, which implies that refugees are treated as 'regular' citizens, might be good, but there is also a downside. Refugees are in a way special, and maybe they should be allowed to be treated that way for a while…" (Manager, adult education center).

The NAV manager also suggested that the model was somewhat outdated: "With enhanced pressure due to increased immigration and settlements, we need to reconsider whether the model is still relevant." These concerns advocated that the model was due for a revision. The presence of competing logics at play among the involved actors came to the fore when discussing the options for revised models. As the NAV manager explained:

> We have a different agenda, we are required to ensure financial independence, while they (the adult education center)—they are in the classroom and they have more the role as helpers (…) We feel in a way that they are holding back; when are they ready to take the language test, when are they ready to try out work practice…. (Manager, NAV)

This quote illustrates how NAV was more anchored in the "work first logic" and the adult education center adhered more to the "protection logic." In spite of these underlying differences, the municipality moved in the direction of a model that accentuated the "place then train logic." The emergence of more concurrent views is highlighted in the following quote by the leader at the adult education center: "We realize that it is good to focus on work."

In line with the "place then train logic," a pilot project together with employers was initiated, which was based on early placement and enabled language training through work practice. The pilot was based in cleaning services, and the employers were actively involved and contributed as resource integrators throughout the qualification period. The pilot was used as a basis for developing the "Introduction Program" in line with the "place then train logic." This meant that a broader set of employers from different sectors and industries were engaged to participate as

resource integrators at an earlier stage of the program. This also included the municipality serving as an employer, contributing spaces for work placement in different departments.

Two other civil sector actors were involved in the program: the local branches of the Red Cross and the Norwegian Trekking Association. They contributed with extra language tutoring and provided language training and social networking through trekking and outdoor activities.

To summarize, the model in case 3 was initially anchored primarily in the "citizenship logic," in which various societal actors were inevitably expected to contribute as resource integrators to ensure social inclusion. Gradually, the involved actors found that the model was somewhat outdated and failed to work as intended because the various actors tended to disclaim responsibility instead of contributing to resource integration. Consequently, the involved actors were mobilized in a new direction for the "Introduction Program," which now largely enacted the "place then train logic." This expanded the service ecosystem, and thus a larger set of actors were mobilized as resource integrators.

6.5.4 Comparisons and Discussion

The purpose of this chapter has been to explore how different institutional logics influence resource integration in service ecosystems and to address how this in turn impacts the services. The relevance of applying a service ecosystem lens in studies of services aiming to support social inclusion of immigrants is rather evident. Due to language barriers and unfamiliarity with the local culture, immigrants need various kinds of support from public service systems. However, social inclusion cannot be realized without engagement with various actors in the local communities. As argued by S-D logic, the value of services is not related to the content of the program as such, but rather to immigrants' experiences and feelings of being socially included as a result of participating in the program. This takes place in arenas beyond the encounters with the focal service system, such as the work place, the neighborhood, and various social arenas. In order to reach the aims of the program, the focal service system is dependent on mobilization of external actors as resource integrators during the program period.

However, the overview of the four cases in Table 6.1 indicates that the municipalities' ability to activate resources in a broader set of service systems differed. While all four municipalities had similar collaborative links to civil society and volunteer organizations, the links to the labor market varied. In case 4, there was a significant cognitive distance between the actors of the focal service system, and the collaboration was poor. Internal conflicts and disagreements hampered collaboration with external actors, and this weakened the resource integration with a broader service ecosystem. In case 1, the collaboration with employers was initiated in a more systematic and comprehensive manner during our study, and the interviews revealed that this was linked to increased collaboration across the units within the focal ser-

vice system. As the leader of the adult education center explained, "we have reached a more shared understanding of common goals." Yet we found that cases 2 and 3 had most systematically and comprehensively been able to engage with local employers, which is why we have zoomed in on and given more detailed descriptions of these two cases. These descriptions illustrate further how the ability to negotiate and balance between different logics can be linked to the functioning of the ecosystem.

Informants in both cases underlined how dialogue and the articulation of the actors' different "logics" had been important for reaching a common ground that enabled collaboration within the focal service system and consequently more comprehensive and systematic collaboration with external actors in the labor market. In both cases, the "place then train logic" became gradually more accentuated, which involved negotiations with the "citizenship logic," "protection logic," and "human capital logic."

The relations between service ecosystems and institutional logics have been identified as a fruitful avenue for theorizing in service research (Edvardsson et al. 2014; Vargo and Lusch 2016). The findings of the present study point in a somewhat different direction than previous research on this topic. Frictions and conflicts between different logics in service ecosystems tend to be perceived as a positive force in the research literature, because they spur creativity and innovation and lead to the positive restructuration of these systems (Baron et al. 2017; Edvardsson et al. 2014; Siltaloppi et al. 2016; Skålén et al. 2015). The results of our study indicate that resource integration in service ecosystems requires that the actors manage to negotiate and balance the coexisting logics. Such balancing and negotiations enhance the capacity of value cocreation among the actors in the service ecosystems.

6.6 Conclusions

This chapter has addressed a human-centered service area in which the potential for improvements is largely linked to the service units' ability to interact and collaborate with external actors in a service ecosystem. Since we have examined services whose aim is to support social inclusion for immigrants, the relevance of this approach is quite obvious. Social inclusion cannot be enabled solely through interactions between immigrants and a public service system, but requires effort and resource integration from a broad range of societal actors. We have explored how the services' ability to support social inclusion is linked to underlying dilemmas and controversies, which we have conceptualized as coexistence of different institutional logics.

While digitalization of the service system can have an indirect impact on how these services perform, we have shown that challenges and constraints to improvement are linked to tensions between different views of how such services should be arranged. Shared digital solutions between the interacting actors were called for among informants in the study, as they were expected to support collaboration and strengthen the ability to provide continuity in service delivery across service units. However, the need for better digital solutions seemed to be a rather small piece of the puzzle, as the underlying tensions between different logics would likely prevail regardless of the

information systems in use. This highlights the necessity of looking at the potential and the impacts of digitalization in human-centered services as entangled with the various underlying tensions and controversies that form the service systems.

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Chapter 7
The Views of Professionals on Patients' Value Co-creation Activities in Public Healthcare

Liudmila Bagdoniene, Aurelija Blazeviciene, and Gintare Valkauskiene

Abstract The purpose of this chapter is to study how healthcare professionals conceive patients' value co-creation activities and what kinds of organizational factors they perceive to support or hinder value co-creation. The study is based on an empirical examination of public healthcare organizations (HCOs) in Lithuania and is qualitative in nature. We carried out semi-structured face-to-face interviews with doctors and used focus groups with nurses. Our results indicate that doctors and nurses recognize patients' value-creating activities quite well both in the service encounter and in the patients' own contexts. The significance of social interaction and virtual communication was emphasized by the professionals. However, they had difficulties in taking the patients' perspective in the actual care. They highlighted patients' compliance to care plans and orders, which reflects traditional professionalism and power asymmetry. Lack of resources, heavy workload, bureaucracy, poor communication, and unsatisfactory managerial capabilities were regarded as the main factors restricting value co-creation.

Keywords Value co-creation · Healthcare professionals' view · Patient activities · Public healthcare organizations

7.1 Introduction

Value co-creation has gained the attention of academics and practitioners as an overarching concept that describes collaboration among various actors (Ranjan and Read 2014). It can be defined as the integration of resources through cognitive and

L. Bagdoniene (✉) · G. Valkauskiene
Kaunas Technology University, Kaunas, Lithuania
e-mail: liudmila.bagdoniene@ktu.lt; gintare.valkauskiene@ktu.edu

A. Blazeviciene
Lithuanian University of Health Science, Kaunas, Lithuania
e-mail: aurelija.blazeviciene@lsmuni.lt

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behavioral activities and interactions in a service network (McColl-Kennedy et al. 2012). Co-creation with customers and users is particularly important, because the value of goods and services is revealed in the use context (Vargo and Lusch 2016).

The emphasis on use value is relevant, not only in business but also in the public sector. Healthcare is one of the main sub-sectors in the public context. Traditionally, the concept of "patient" has referred to the users of healthcare services. The etymology of this word means "to suffer or bear"; thus, it supports the traditional view of a passive recipient of treatment by experts (Hudak et al. 2003). This view does not fit well to the preventive view which aims to empower citizens to self-care. The market-based concepts of "customer" and "consumer" have been suggested as alternatives to highlight the new interpretation of the patient's role. They imply the generation of healthcare systems that are increasingly patient-centered and adopt models of collaborative care (Sweeney et al. 2015) – also called integrated patient care (Singer et al. 2011) or person-centered and relationship-centered care (Entwistle and Watt 2013). The application of the co-creation perspective supposes that the patient is no longer considered a passive recipient of services but is treated as an active co-creator of value (Krisjanous and Maude 2014; McColl-Kennedy et al. 2012, 2017; Nambisan and Nambisan 2009; Osei-Frimpong et al. 2015). The participation of patients is seen to lead to better medical outcomes, lower costs, more effective and efficient service delivery, increasing quality and satisfaction (Gallan et al. 2013), and the personalization of healthcare (Vogus and McClelland 2016).

Despite the growing number of studies, there are many open questions concerning value co-creation in healthcare. They include, among others, the most appropriate healthcare model to generate and support co-creation practices and the impact of the progress of health or illness on co-creation (Krisjanous and Maude 2014). An important issue is the nature of the interaction in the doctor-patient dyad as a resource that can be managed for value co-creation (Osei-Frimpong et al. 2015). A problem is often how to create an organizational culture that supports patient participation: what its components are and how they are manifested (Sharma et al. 2014). Further issues are prerequisites for the patient involvement in value co-creation and its barriers in the healthcare environment (Hardyman et al. 2015; Palumbo 2016). From a more general perspective, the question is how to move to service-dominant logic (SDL) – a logic that highlights value as a result of co-creation, not as an intrinsic property of goods and services (Joiner and Lusch 2016).

The readiness of patients to take more responsibility for their health and to collaborate with healthcare professionals has been confirmed by several studies, e.g., by Aggarwal and Basu (2014), Elg et al. (2012), and Sweeney et al. (2015). Nonetheless, to be co-creators, patients ought to be supported by suitable processes, methods, and tools that enable this active role (Elg et al. 2012; Stiggelbout et al. 2012). Moreover, healthcare professionals should adjust their mindset when they and patients become true partners (Lorig 2002). This requires new knowledge and skills and new dispositions (Batalden et al. 2015) as well as a change in the attitudes and behavior, which are often based on the traditional view on professional superiority (Cayton 2006).

The purpose of the present chapter is twofold. First, we aim to find an answer to the question which patients' value co-creation activities are uncovered by professionals inside and outside the healthcare organization. Second, we aim to understand which constituents of the institutional setting may facilitate or discourage the healthcare professionals to co-create value with patients. The empirical context of this study is public healthcare organizations in Lithuania.

7.2 Literature Review

7.2.1 Patients' Activities in Value Co-creation

Value co-creation is dynamic, interactive, customized, and experienced uniquely by customers (beneficiaries) (Vargo and Lusch 2008). In a theoretical sense, value is always co-created; in practice, it is often interlinked with co-production and interaction (Sundbo and Gallouj 2000). The service provider drives co-production, and customers are more or less actively involved in the process, contribute to knowledge acquisition and dissemination, and help deliver the service outcome through their actions. Value co-creation encompasses the customer's physical, mental, or possessive activities, practices, and experiences in multiple individual and collective social contexts (Grönroos and Voima 2013). A sample of scholarly views on value co-creation activities in healthcare is presented in Table 7.1.

Table 7.1 shows that value co-creation activities in healthcare vary from simple (e.g., compliance) to complex (e.g., co-learning) (McColl-Kennedy et al. 2012) and differ by patients' efforts (Sweeney et al. 2015). Consequently, healthcare organizations (HCOs) must recognize that the patients diverge in their skills, abilities, and willingness to co-create (McColl-Kennedy et al. 2012). Information and knowledge sharing and learning have been highlighted as central part of activities in value co-creation. In healthcare, the interaction between healthcare professionals and patients is affected by information asymmetry. The question is not of an asymmetric quantity of information in the first place but rather of cognitive abilities with varying interpretation schemes (Barile et al. 2014). Thus, the main way to reduce information asymmetry is the building of trust-based relationships. Emotional aspects have been highlighted by Sweeney et al. (2015) and by Gallan et al. (2013). Participation in the planning, decision-making, implementation, and evaluation of the actual care has also been pointed out.

Value co-creation does not only depend on interactions among the actors but requires the examination of other attributes, too. The social context of service encounter, the beliefs and perceptions of the patient and the doctor, and their partnership are imperative for value co-creation processes (Osei-Frimpong et al. 2015; Plé 2016). The context in which services take place shapes the interaction between the provider and customer and the way in which the provider accesses customer resources. The employees perceive and interpret customers' actions and resources

Table 7.1 Scope of value co-creation activities in healthcare

Healthcare professionals' and patients' value co-creation activities	Authors
Cooperating Collating information Combining complementary therapies Co-learning Changing ways of doing things Connecting Co-production Making shared decision	McColl-Kennedy et al. (2012)
Discussing current health conditions and symptoms Cooperating with diagnostic efforts Sharing knowledge about potential treatment options Expressing comfort level with, and desire to pursue, specific therapies and procedure	Gallan et al. (2013)
Connecting: relationship establishment and nurturance Caring for wider networks and resources Goal setting and planning Maintaining health and well-being of treatment unit Journeying through "the system" Knowledge seeking and learning Surveillance and monitoring: documenting and reporting Recovery Reconciliation of events and promoting mutually rewarding experience	Kristjanous and Maude (2014)
Within-clinic activities Actively sharing information Compliance with basic requirements Proactive involvement in decision-making Interactions with staff Outside clinic activities Information seeking Diversionary activities Managing practicalities of life Self-generated activities Emotion regulation Positive thinking	Sweeney et al. (2015)

and make sense of them (Edvardsson et al. 2012). These perceptions depend on their emotions, cognitions, and actions to access customer resources (Payne et al. 2008). Plé (2016) notices that employees not only successfully integrate but also disintegrate (misuse) resources; further, they may fail to integrate the customer's resources with their own resources. Thus, value is not always co-created, but it may also be co-destroyed.

Prahalad and Ramaswamy (2013) argue that value lies in the co-creation experience and depends on a specific patient, point of time, location, and the context of a particular event. The experiential and context-specific nature of value highlights the importance of the knowledge about how customers create value. In the healthcare context, this means that a profound understanding of customer context, processes,

and experiences both during and outside the treatment is needed (Payne et al. 2008). Understanding the role of patient as value co-creator helps to better support customers' behavior in healthcare (Aggarwal and Basu 2014). This understanding is pivotal to doctors and nurses as frontline employees who are day-to-day involved in value co-creation. However, there is little research which focuses on the employees' views on the value co-creation behavior of customers (Plé 2016; Yi and Gong 2012).

7.2.2 The Institutional Setting of Value Co-creation

Successful value co-creation rests heavily upon the degree to which an organization is able to enhance its customers' resources (O'Hern and Rindfleisch 2010; Vargo and Lusch 2016). Also in healthcare, organizations should rethink the ways which allow encouraging co-creative behavior (Cosgrove et al. 2013). They should acknowledge all areas of the value co-creation process in which the patients could be given the roles of active participants (Osei-Frimpong et al. 2015).

Several studies demonstrate the need to reinforce the openness of organizational culture. An open organizational culture empowers patients to apply their knowledge and skills and encourages them to make choices and take initiatives in a service co-creation process (Gill et al. 2011). It also helps to recognize and accommodate patients' individual medical needs and preferences (Singer et al. 2011); further, it envisages value co-creation desires and unlocks the opportunities for patients to participate in co-creation (Krisjanous and Maude 2014). Open culture is an important precondition to maintain collaborative relationships and encourage patients to be active and conscious when healthcare decisions are made (Street et al. 2003). For the development of an open organizational culture, the healthcare leaders should implement initiatives that include system-wide standards of behavior and define processes for employee interactions with patients. An important focus here is helping to reduce anxiety and fear and translate them into options for specific follow-up behaviors, with the choice acceptable to the patient (Hegwer 2014).

On the other hand, the treatment is only one part of the value aspired by patients. Respect, aesthetics, spirituality, and ethics compose other "slices" of the value derived from the patient encounter with the healthcare organization (Loane et al. 2014). This means that healthcare professionals should refine their practices in helping patients recognize and manage their actions and emotions to facilitate positivity, develop educational skills, and learn self-management (Gallan et al. 2013). Teaching of problem-solving skills to patients is important in order to increase patients' understanding of their situation and enhance lasting change in their lives (Mikkonen and Hynynen 2012).

To facilitate value co-creation, service providers should be empowered with the requisite job-related knowledge; in this way, they become able to take initiative and exercise choice in executing their role (Gill et al. 2011). Sharma et al. (2014) argue that the increasing participation of patients generates new pressures to develop organizational capabilities. The needs of patients change dynamically, and the

healthcare providers have to identify and respond these changes. Ramaswamy (2009) highlights the critical role of top management for developing the capacities to co-create value – top management is responsible for reinforcing the co-creative mindset and skills of professionals, fostering internal collaboration, and nurturing co-creation initiatives. Yet, becoming a co-creative organization also requires active involvement of managers at other levels. In sum, successful value co-creation is based on organizational ideology and professional attitudes (Marlett et al. 2015). However, many healthcare organizations still lack comprehension of the capabilities required to enhance the patients' involvement in co-creation.

7.3 The Study Context

The present study was performed in public healthcare organizations in Lithuania. The selection of this context was motivated by two reasons. First, Lithuania is an example of a country in which public institutions dominate the health system. In 2016, there were 130 public hospitals, i.e., inpatient institutions, and 393 public outpatient institutions, both governed by the Ministry of Health and local authorities (Lithuanian Health Statistics). Inpatient care generally refers to any medical service that requires admission into a hospital, while outpatient care is medical service that does not require a prolonged stay at a facility. The private sector is very limited in the provision of inpatient care but plays a substantial role in outpatient (primary) care and dental care.

Second, healthcare resources measured in terms of health professionals (particularly doctors) per inhabitants are good, but simultaneously the collaborative way of working is underdeveloped. Lithuania has a considerably higher number of physicians (4.3 per 1000 inhabitants) than the EU average (3.6) and a slightly lower number of nurses (7.7) compared with the EU average (8.4) (Lithuania: Country Health Profile 2017).

The availability of services is reflected in the use statistics. In 2016, one resident visited a physician 9.2 times on average (here, the number of visits to primary care was 6.12). This number is higher than in other EU countries (Lithuanian Health Statistics 2017). On the other hand, the health status of the Lithuanian people still remains below most European Union countries, even though it has improved over the past 10 years (Lithuania: Country Health Profile 2017). Continuous reform has reshaped the Lithuanian healthcare system, but there are big challenges in meeting healthcare needs more effectively and in delivering healthcare services more efficiently. Thus, new ways are sought to improve the quality, the accessibility, the effectiveness, and the efficiency of healthcare services. Value co-creation with patients is considered to be one means to overcome these challenges.

7.4 Research Method

The study was based on qualitative methodology. The strength of this methodology is the possibility to acquire contextual, in-depth understanding of the perspectives of participants (Green and Thorogood 2014). In our context, this possibility was important because knowledge about professionals' perspective to value co-creation in healthcare is scarce. Semi-structured interviews and focus groups of healthcare professionals were the concrete methods for gathering the primary data. The participating professionals were contacted based on our relationships with the Lithuanian medical community. Thus, we used targeted sampling (Daniel 2012), which ensured that the invited participants were well motivated. They represented different subsectors of healthcare (family medicine, general medicine, and specialized medicine), several specializations (e.g., anesthesiology, pediatrics, geriatrics, traumatology, rehabilitation, etc.), and professional groups (doctors and nurses). All invitees consented to participate and to be interviewed regarding their personal experiences on patients' value co-creation activities.

The study was organized as follows. First, the data from the doctors was collected using semi-structured interviews. We started from doctors because the doctor-patient relationship is central in the medical practice. Moreover, the doctors promote the collaborative partnership between the patient and the other healthcare professionals (Silverman et al. 2016). The size of the semi-structured interview sample was 13 doctors who differed by gender, age, and work experience (Table 7.2). We identify them by using alphabetical letters A, B, C, etc. In the beginning, we did not fix the number of interviewees. We continued the supplementation of the sample until the data were saturated (Guest et al. 2006).

The semi-structured interviews took place in the organizations in which the respondents worked. Each interview took around 55 min to complete; all of them were recorded and after that transcribed.

Table 7.2 The profiles of semi-structured interview respondents

Respondent	Specialty	Gender	Age	Experience (years)
A	Family medicine	Female	52	27
B	Pediatrics	Female	32	5
C	Intensive care (children)	Female	58	30
D	Family medicine	Female	56	30
E	Geriatrics	Female	58	32
F	Traumatology	Male	33	8
G	Intensive care (adults)	Male	51	28
H	Traumatology	Male	63	38
I	General medicine	Male	35	9
J	Urology	Male	57	34
K	Intensive care (adults)	Male	61	38
M	Rehabilitation	Female	61	38
N	Rehabilitation	Male	62	39

In order to get a more versatile professional view on patients' value co-creation activities, two focus group sessions with nurses were conducted. The nurses' interactions with patients are often closer than those of the doctors. Thus, the nurses' insights may help in understanding deeper the ways in which patients contribute to value co-creation. The first focus group consisted of eight participants, and the second of seven participants. This number of participants is in line with the recommendation of the focus group researchers (McDaniel and Gates 2007). All focus group participants were female. They had been working in different local areas and clinical departments and had a different length of experience in nursing (see Table 7.3). We identified them with names, but to ensure privacy their names were changed.

The focus group sessions were held in a conference room of the Lithuanian University of Health Sciences. The session took 65 min with the first group and 70 min with the second group. The discussions were recorded and later transcribed and analyzed.

Four main topics were included in the interviews and focus group discussions: (1) signs of patients' willingness to collaborate and professionals' views on patient value, (2) patients' activities inside and outside the healthcare organization, (3) interaction between healthcare professionals (doctors and nurses) and patients, and (4) factors influencing on value co-creation. We explained and clarified questions when needed and added questions to follow up interesting ideas and to direct the

Table 7.3 The profiles of focus group participants

Number of focus group	Name of the participant (changed)	Clinical department	Experience (years)
First group	Laima	Pediatrics	38
	Indra	Surgery	3
	Aneta	Obstetrics and gynecology	2
	Rasa	Therapeutics	22
	Neringa	Cardiology	10
	Jurga	Pediatric surgery	24
	Saule	Therapeutics	4
	Vaiva	Psychiatry	22
	Vilma	Neurosurgery	2
Second group	Rima	Intensive care	25
	Violeta	Maxillofacial surgery	2
	Odeta	Ophthalmology	23
	Renata	Obstetrics and gynecology	10
	Kristina	Child development center	25
	Eugenija	Therapeutics	27
	Inga	Surgery	3

questions toward the topics. The discussions with participants were open in both the interviews and focus groups.

The data obtained were analyzed using the qualitative content technique (Roller and Lavrakas 2015). First, we developed codes from the data using our literature review as the theoretical basis. In this way, we aimed to secure validity and reliability (Elo et al. 2014). Second, we coded the interviews and focus group discussions using MAXQDA12 software. It is a widely accepted analysis tool for qualitative research and allows a detailed analysis of transcripts (Silver and Lewins 2014). Third, we analyzed and interpreted the coding results following a dialogue between the theoretical and empirical material (Kvale 1996).

7.5 Research Findings

7.5.1 Patients' Value Co-creation Activities

As a starting point for the examination of the professionals' views on the value co-creation activities of patients, we asked what helps them to explore the patient's readiness to get involved in collaboration. According to doctors, important signs are the time used, the interest expressed, and the explanations requested. The nurses mentioned the patient's efforts to get more information about the illness and its treatment. The next question concerned the professionals' understanding of the contents of patient value. The majority of doctors and nurses considered that this value consists of the changes in patients' health status, of the improvement of emotional and psychological conditions, and of better quality of life. Also new technologies and equipment, treatment procedures and methods, and medicines were mentioned as part of patient value. The result indicates that the end result and professional know-how are central in the value views of healthcare professionals; they can even be considered product-centric at least to some extent. On the other hand, the professionals also emphasized the criticality of the patient contribution to value creation.

After these preliminary observations, we analyzed the co-creation views of professionals more systematically, separating patient activities inside HCO (during the care) from those outside HCO (before and after the care). We used a framework that we compiled from the categorizations created in earlier literature by different authors (see Table 7.1). The selection of categories was based on our empirical material: the views expressed in several interviews were picked up; thereafter, the categories corresponding to them were sought. As a result, our framework includes categories identified by Sweeney et al. (2015) in their division to within- and outside-clinic activities and also categories recognized by Gallan et al. (2013), Krisjanous and Maude (2014), and McColl-Kennedy et al. (2012). We present first the results that we received from the interviews of doctors. The categories of intra-organizational co-creation activities, together with respective examples, are presented in Table 7.4.

Table 7.4 Patients' value co-creation activities inside HCO (according to the interviews)

Category of activities	Examples (data extracts)
Compliance with the doctor's requirements	*In intensive care, the patient is always more willing to cooperate; they are more responsive to our remarks and certain requirements* (Respondent K)
Participation in decision-making	*We outline the treatment plan and discuss what the possible results may be: the immediate ones and those taking place later* (Respondent D)
Giving feedback	*Patients tell us about their feelings, pain, their everyday practices after treatment, etc.* (Respondent B)
Collating information	*Patients look for the best, so they collect and compare information* (Respondent H)
Knowledge seeking and co-learning	*When a patient knows a lot, elementary things need no explaining. With them, the doctor needs to choose the way they will have to go* (Respondent G)
Emotion regulation	*When people are ill, they are very sensitive, they hyperbolize many things. So, they need efforts for managing emotions* (Respondent A)

Our findings confirm the importance of information and knowledge seeking and co-learning as patients' co-creation activities. However, even though our questions concerned the activities of patients, many answers reflected the view how the doctors wanted the patients to behave. For instance, patients' knowledge seeking was considered useful because it helps the doctor to skip elementary explanations. Profession-centric thinking was particularly apparent in the topics of feedback and decision-making. Here the involvement of the patient was either purely doctor-led or the essence of the cooperative behavior of the patient was seen to be in the agreement of the doctor's plan. The answers actually resembled quite much the descriptions of the compliance behavior of patients. Also the doctors' reactions to patients' emotion regulation reflected the view of an outsider, not empathy toward the fears caused by sickness. Despite these findings, our study indicates that striving for value co-creation is emerging among the interviewed doctors. When we compare our findings to earlier studies, there are very few dimensions that we could not identify at all (cooperation in diagnostic efforts and maintaining health and well-being of the treatment unit were such dimensions).

The interviewees highlighted that value co-creation does not only take place during the face-to-face interaction between the patient and the doctor. Contribution is often needed from another HCO, and today it can be increasingly realized by using distant consultation. The participants also emphasized the importance of the contribution of family members, friends, and various communities surrounding the patient. Patient communities can help via experience sharing, and religious communities can offer support via a broader perspective on human life. External sources of value are particularly crucial in the case of long-term treatment. Table 7.5 presents the categories of patients' value co-creation activities outside HCO, together with illustrative examples.

In focus group discussions, the nurses reported similar activities of value co-creation like the doctors, but their descriptions were made in more concrete

Table 7.5 Patients' value co-creation activities outside HCO (according to the interviews)

Category of activities	Examples (data extracts)
Distant consultations with the doctor	*Patients send X-ray pictures and demand advice* (Respondent H)
Integrating resources from other healthcare organizations	*Patients look for help from regional or university hospitals* (Respondent E)
Collating information	*Patients look for the best, so they collect and compare information* (Respondent D)
Socializing via the Internet	*Patients need audience, people with the same disability to communicate with, so that they would not feel lonely. Let them write comments on the Internet, maybe this is what they need* (Respondent G)
Managing practicalities of life	*Patients follow my recommendations, do what I require…* (Respondent F)
Caring for wider networks and resources	*Communities are very useful… like a family… such a good emotional field. There is a strong community with monks. The majority of those who have an oncological disease turn to religion. Monks are very helpful* (Respondent M)

terms (see Table 7.6). Most activities are common to a major part of patients, but there are some activities that contribute particularly to value co-creation in acute care and some other activities that are characteristic of chronic diseases and their treatment. As many of the mentioned activities/actions can be performed both inside and outside HCO, we have collected the results in one table and just mark whether the activity can be found inside and/or outside HCO. Instead of exemplary extracts, we illustrate each category of activities with a summarizing explanation based on the discussions in the focus groups.

The study results show that in value co-creation activities, patients integrate various own and external resources (information, knowledge, and social resources). In this regard, the findings are in line with earlier studies. However, our study also highlights a few new facets. In addition to patient activities identified earlier (the categories to which we have compared our results), we identified distant consultancy and the use of social media as important categories enabled by digitalization. Further, as mentioned above, the same value co-creation activities may be accomplished by patients both inside and outside the healthcare organization. Finally, the patients' financial resources for value co-creation are important. In order to get better treatment results, the patients are often forced to spend money for medicines and nursing aids and to pay for rehabilitation and wellness services.

In sum, our study indicates that health professionals' awareness about the importance of value co-creation is visible in different topics linked to patient activities. However, in intraorganizational activities – in the actual interaction with patients – the professional dominance is still strong. This is especially true regarding doctors. It seems difficult to doctors to imagine the treatment situations from the patient's position. They speak about patients' activities from different viewpoints (information gathering, decision-making, etc.) but emphasize their own orders that patients

Table 7.6 Patients' value co-creation activities and actions (according to the focus group discussions)

Category of activities	Summarizing explanation based on the focus group discussions	Inside organization	Outside organization
Sharing information	Openly share information with healthcare professionals about own health problems and their reasons	+	
	Provide suggestions concerning the improvement of the organization of services	+	+
	Share knowledge and information with other patients and their family members	+	+
Giving feedback	Observe own health, make records, and discuss them with a doctor and a nurse	+	+
Participation in decision-making	Discuss possible/applied treatment alternatives and the nursing/care plan	+	
Compliance with the requirements of doctors and nurses	Honestly comply the instructions of healthcare professionals	+	+
	Arrive to consultations and procedures on time	+	
Knowledge seeking and co-learning	Be involved in clinical studies of new treatment methods and medications	+	+
	Take part in health training and preventive programs	+	+
Social activities (via the Internet)	Share obtained information about the disease, the treatment, healthcare organizations, medical personnel, etc. in a social network		+
	Be involved in patients' organization activities		+
	Provide help to other (especially difficult) patients	+	
Collating information	Collect and analyze information about own disease and treatment possibilities	+	+
	Confer with other medical professionals the treatment alternatives	+	+
Caring for wider networks and resources	Combine traditional treatment with alternative medicine (based on the doctors' initiatives and one's own initiatives)		+
	Provide money to purchase the necessary medication, nursing, and wellness means	+	+
Managing practicalities of life	Change unhealthy habits that disturb the improvement of health		+
	Learn to live with the disease and its consequences	+	+

should follow to achieve a successful outcome. It is interesting that this one-sided view is easier to give up when extra-organizational activities are discussed. The interviewed doctors understood well the importance of patients' social networks and also highlighted virtual social behavior in a very modern way. Nurses as focus group participants found the role of the patient as value co-creator as quite new in the Lithuanian public healthcare. Not all patients neither all nurses comprehend properly this role and involve in value co-creation processes. Whether and how healthcare professionals encourage the patients to be responsible for their health and co-create value for themselves also depends on organizational factors. These factors include organizational philosophy, organizational culture, HCO executives' mentality, and the dominant relationship model among healthcare professionals and patients.

7.5.2 Influencing Factors in Value Co-creation

In our examination of the institutional factors that influence value co-creation inside HCO, five main factors came out: the level of workload, bureaucracy, the provision of resources, support systems, and communication. The participants highlighted that each of these factors can have a positive or a negative impact on value co-creation. We start from the negative impacts as removing or at least relieving them is crucial from the viewpoint of success. Table 7.7 summarizes how the interviewed doctors explained the unfavorable influences of the main factors.

Similar issues that disturb the doctors' value co-creation with patients were indicated by nurses. In addition, the nurses emphasized the possibly negative impact of the organization culture: collaboration problems between doctors and nurses and misconceived views regarding the profession of nurses (they are still viewed as assistants rather than partners of holistic patient care). In addition to the institutional and organizational factors that discourage value co-creation, limited time available for patient consultation/care and insufficient communication skills were mentioned as the main factors that restrict value co-creation.

Table 7.7 Discouraging factors and their influence on value co-creation

Factors	Explanation (data extracts)
Heavy workload	*In many cases, a general practitioner has too many patients. There is no possibility for sufficient discussion* (Respondent D)
Scarcity of resources	*I should have access to tests that are indispensable. If they are not available, I start thinking how this can be done in a different way. The quality of diagnostics suffers; time is lost* (Respondent B)
Bureaucracy	*A doctor has to fill in a lot of documents. Sadly, but we must prioritize the documents, not the patient's treatment* (Respondent D)
Absence of support systems	*We need some scripts that tell us how to act in a certain situation, what should be done, and what shouldn't. They could save a lot of time* (Respondent C)
Communication	*There is not training on how to communicate with patients* (Respondent E)

Among the positively influencing factors, the study participants (both the doctors and the nurses) highlighted working conditions. The provision of resources was considered important in particular – doctors and nurses cannot provide patients with high-quality services if the resources essential for the treatment are scarce. The interviewees also noted that value co-creation is encumbered by the absence of support systems that help healthcare professionals to develop a culture of mutual collaboration. The dissemination of information on routine situations should be facilitated so that the doctor-nurse teams have enough time to discuss complicated cases and develop themselves professionally. The support system also increases personal security and protects professional honor and dignity.

Summarizing the views on facilitating and discouraging factors in value co-creation, we can say that the organizational problems are similar to those found in earlier studies on healthcare. The considerations about collaboration also reflect typical issues linked to the position of professionals in the modern society (Alvesson 2004). Country-specific features influence the end result, too: the early stage of the healthcare renewal is reflected in many factors of the organizational environment.

7.6 Discussion

The quality of healthcare is one of the most important factors in how individuals perceive their quality of life. Patients are increasingly becoming stakeholders in their own healthcare journey: they demand high-quality services, want to choose the time and place of appointments, ask for the latest drugs and clinical trials, and require transparent access to information about their healthcare. Patient-centric care and a better patient engagement have shifted the focus of the healthcare industry from volume-based to value-based delivery models (Healthcare challenges and trends 2014). In this context, HCOs are searching for new collaboration practices that would help in solving problems and would secure successful results. These practices include professional-patient interaction, the empowerment of patients to active self-care, and the utilization of resources of patients and their social networks (Ouwens et al. 2005). The present study has examined these developments using an empirical case from Lithuania and applying value co-creation as a central concept.

The first aim of our study concerned the issue of whether the professionals actually recognize patients' activities and consider them valuable. Understanding the customer's value-creating processes has been emphasized as an essential prerequisite for value co-creation (Payne et al. 2008). It is important to point out that value does not only emerge in the interaction between the provider and customer, but it also arises in the consumption stage (Lusch and Vargo 2006). Our study indicates that doctors and nurses recognize patients' activities to affect the results in both of these stages: in the service encounter and in the patients' own contexts. Despite of this recognition, the doctors and nurses had difficulties in taking the patients' perspective. They (especially the doctors) highlighted patients' compliance to care plans and orders, which reflects traditional professionalism and power asymmetry.

The identified examples of patients' activities during the visit to the doctor (e.g., participation in decision-making, information collation) correspond in several respects to earlier studies (McColl-Kennedy et al. 2012; Sweeney et al. 2015). In the activities outside the actual interaction, our study brought to the fore the significance of social interaction and virtual communication, which have not been specifically emphasized in the earlier analyses of value co-creation. However, they are today central means that help the customer use, maintain, and adapt the offering to his/her individual needs (cf. Vargo and Lusch 2004). Distant consultation with a medical professional via telephone, Skype, and other devices of mobile communication essentially facilitate the acquisition of necessary help. An interesting observation was that the professionals understand quite well the importance of patients' social networks as additional resources. Here, too, the role of virtual communication came out as an important new opportunity – for instance, peer support in long-term diseases is often sought via social media.

The second aim of our study focused on factors which can facilitate and restrict the value co-creation. The opinion of the interviewed doctors and nurses was that there are more limiting than supporting factors in this regard. Among the restricting factors, organizational problems were highlighted and were seen to be linked to the lack of resources and managerial and cultural capabilities in healthcare organizations. Especially the lack of necessary resources, too big workload, and deficient support systems for doctors hinder successful value co-creation with patients. The latter two points may reflect poor managerial capabilities besides resource problems, i.e., they may indicate that efficient management – which Prahalad and Ramaswamy (2004) and Ramaswamy (2009) regard as an obligatory condition for value co-creation – is missing in our case organizations. There also seems to be insufficient staff cooperation and mutual help – factors that reflect cultural capabilities whose role in value co-creation has been emphasized as well. In the studies of Hegwer (2014) and Sharma et al. (2014), the development of collaborative and open culture was noted as a necessity for value co-creation in the healthcare context.

Furthermore, skills shortages and attitudinal problems make value co-creation inefficient. The interviewed doctors and nurses stated that they have not enough communication skills to maintain fruitful dialogue with patients. As interaction between people is the locus of value co-creation (Ramaswamy 2009) and fosters value co-creation (Gummesson and Mele 2010), poor relational skills weaken the utilization of patients' resources for the achievement of positive treatment results. In addition, patients have attitudinal problems which lead to the misuse of their resources: indifference regarding one's own health and neglect regarding the prescriptions of doctors. Our study revealed a "vicious circle": the lacking skills of participants cannot change the negative attitudes of patients, and together these problems maintain non-successful co-creation. This finding has similarities with the study of Hottum et al. (2015) which shows how patients' behavior depends on healthcare professionals' emotional intelligence. During the interaction, health professionals should be able to recognize patients' and their relatives' emotions and direct their thinking and behavior so that it is adjusted to the situation.

7.7 Managerial Implications

In several countries, integrated care programs have been adopted as a managerial solution to the problems of healthcare. These programs aim at simultaneously developing organizations, technologies, services, and relationships between different stakeholders participating in treatment efforts. They highlight patient support and education, combined with structured clinical follow-up and case management. They include multidisciplinary care teams and segmented clinical pathways; feedback and reminders to patients; education and decision support for professionals; and utilization of clinical information systems. In many illnesses, utilizing community resources and investing in self-management are central (Ouwens et al. 2005).

Our results indicate a clear need for such an approach in Lithuania, too. While the country has specific strengths – the high number of doctors per inhabitant – it seems to be underdeveloped in the practical implementation of healthcare. In order to take steps forward, both general understanding of modern developments has to be improved, and concrete activities have to be launched.

Understanding of the current healthcare trends means accepting the fact that patients are no longer merely the providers of information for diagnosis. They are more enlightened, informed, and active (Robinson and Ginsburg 2009). This requires the replacement of the traditional occupational professionalism with organizational and hybrid professionalism that considers patients as a party in the production of healthcare service and takes into account their unique characteristics which influence the concrete ways needed in collaboration (Nordegraaf 2015). An essential aspect in tackling the challenges of modern healthcare is the insight that different improvements should form a systemic whole. One-by-one improvements usually fail because in a systemic context (like healthcare), decisions of one actor trigger others to act, which again alters the next decisions of the original actor (Sterman 2001).

Among the concrete activities implied by our study, training seems particularly important and concerns both the professionals and the patients. The doctors and nurses not only need a broad range of skills which enable them to provide clinically sound care, but they also should understand changes in patients' behavior and be emotionally responsive (Arora et al. 2010). Increasing patient involvement should be enriched hand in hand with the education of patients. Lack of the knowledge, skills, and motivation necessary for the treatment process essentially diminishes the possibility of a positive end result in healthcare. Damali et al. (2016) point out that customers who are taught why they should perform the tasks requested have higher levels of motivation to perform these tasks suitably. Thus, the education of patients is crucial to make clear their role and input in value co-creation.

In addition to country-specific managerial implications, our study revealed issues with a general meaning. Most importantly, it confirmed the importance of resource integration both intraorganizationally between the service provider and the customer (patient) and across organizational borders where the customers (patients) acquire resources from different sources. The systemic context of healthcare highlights that the usefulness of any potential resource from one source is moderated by the availability of other potential resources from other sources (cf. Vargo and

Lusch 2016). Our study also shows that the insights regarding the ongoing development do not emerge evenly, but very modern views can be adopted in some topics while old-fashioned views still survive in others. This is illustrated by the doctors' ability to understand and foster patients' broad resource integration outside the organization (including social media) and simultaneously keep strong traditional professionalism as regards the core treatment in which they saw patients' compliance as an ideal instead of value co-creation.

7.8 Concluding Remarks

The systems of healthcare are complex, expensive, and challenging for professionals and patients. Understanding how patients co-create value to better manage their own health is important for individuals and for societies as a whole. Value co-creation between healthcare professionals and patients exists but needs to be further acknowledged and developed. HCOs should reassess their management systems, personnel policy, and organization of treatment and pay particular attention to the new roles of professionals and patients. This would enable them to operate more effectively and efficiently in today's increasingly dynamic environment. Notwithstanding the locally restricted scope of our study, we hope that it provides a step forward on the path toward a better understanding of value co-creation in healthcare.

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Chapter 8
Learning to Interpret Technological Breakdowns: A Path to Technological Literacy

Oliver Alexander Tafdrup, Bjarke Lindsø Andersen, and Cathrine Hasse

Abstract Digitalization and service innovation of the public sector affect the human labor of workers, such as teachers, in unexpected ways, and a new army of IT service workers has moved into their workspaces to provide services and support. In this chapter, we argue, with examples from the field of education, that practitioners cannot rely on help from IT service workers but need to become technologically literate and learn how to cope with *technological breakdowns*.

Keywords Technological literacy · Postphenomenology · Technological breakdowns · Communities of practice · Technology in the public sector

8.1 Introduction

Everyone who is involved with digital technologies – such as computers, software, and tablets – has experienced situations where the technologies suddenly cease to function properly. This phenomenon is often referred to as a *technological breakdown*. Within education, technological breakdowns have become a more and more ubiquitous phenomenon due to the rapid increase of technological artifacts utilized for educational purposes (Riis 2012, p. 87). The breakdowns affect the educational practice with consequences ranging from minor disturbances to rendering it impossible to conduct successful teaching. Thus, knowing how to cope with technological breakdowns is a pivotal part of being technologically literate in a workplace, whether in the public or private sector. While many tend to understand technological literacy as the ability to program or create technology, a Danish project,

O. A. Tafdrup (✉) · C. Hasse
DPU, Aarhus University, Aarhus, Denmark
e-mail: otafdrup@gmail.com; caha@dpu.dk

B. L. Andersen
Epinion Global, Aarhus, Denmark
e-mail: bjla@epinionglobal.com

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Technucation, showed that practitioners in hospitals and schools were in need of a more practice-based everyday knowledge of the relational aspects of technology use (Hasse 2017). Wallace and Hasse define technological literacy in the following way:

> Technological literacy is the capacity for learning from everyday entanglements within the constant reconfigurations of both practice and technology without losing sight of the motive for the practice itself. (Wallace and Hasse 2014, p. 153)

A technological breakdown is precisely an example of an inconvenient entanglement of technology and practice. In this chapter, we will argue, with an example of school teachers based on *Technucation* research, that practitioners involved with digital technologies need to become technologically literate. Workers like teachers often find themselves in acute situations where time is scarce and where the professional work relies on technological tools. It is therefore pivotal for them to possess technological literacy that renders them capable of both coping with and learning from their encounters with technologies that do not function properly or not at all. They cannot just rely on technical staff solving their problems. Being able to act with technological literacy in relation to technological breakdowns in the sense formulated in the quote above requires an ability to interpret what a breakdown is and how to learn from it.

As the title of this chapter indicates, learning from technological breakdowns and learning how to interpret technological breakdowns is an important part of being technologically literate. This is a kind of hermeneutic practice that requires judgment, and the ability to understand how a particular breakdown always is embedded in a larger culture of techno practices.

How can this type of literacy be cultivated? In this chapter, we will argue that the occurrence of a technological breakdown must be followed by the questions "for whom and in relation to what do technologies break down?" These questions draw the attention to the profound ambiguous and relational nature of technological breakdowns. We will elaborate this argument through an analysis of two empirical cases: one from Denmark (tied to *Technucation* research) and another from Australia (tied to a PhD project conducted by Bjarke Lindsø Andersen). Our theoretical perspective is rooted in the relational ontology formulated by the American philosopher Don Ihde (1990, 2012) and in an understanding of practice drawn from cultural-historical activity theory (Engeström 1987). This theoretical framework allows us to analyze how the character of technologies and technological breakdowns vary depending on variables such as the use context and the perspective. By stressing the relational ontology of phenomena in practice, we are able to elaborate the classical phenomenological conception of breakdowns formulated in Heidegger's tool analysis from *Being and Time*.

We have structured the chapter as follows. In Sect. 8.2 after this introduction, we present our case studies that stimulated the research reported in this chapter. We also present the methodological consideration the study is grounded upon. In Sect. 8.3, we introduce *postphenomenology* and *situated learning* as the theoretical background. Section 8.4 includes the actual analysis: the application of the theories we utilize to interpret the empirical data. Here, we also suggest new theoretical constructs:

the *potent* and *impotent* variations of technological breakdowns. We discuss the results of our analysis in Sect. 8.5 and end up with the conclusion in Sect. 8.6.

8.2 Case Studies, Methods, and Data

Beyond our theoretical endeavor, we draw on empirical cases from two different educational contexts. The first is from a Danish primary school, the second is from Australian higher education. In both cases, new educational technologies have been introduced, and in both cases, the supporting IT staff is not able to help the teachers with the continuous breakdowns they experience. In this section, we will outline our research contexts and the methods through which the data is gathered. Finally, we will discuss what the two different contexts bring to our research scope.

The first empirical context we draw on is the Danish primary school. Our point of departure is in an interview conducted as a part of the Technucation research project on technological literacy in the teacher and nursing professions (Hasse et al. 2015; Søndergaard and Hasse 2012).[1] The interview is from the pilot of the project (2011) which consisted of 34 interviews, equally distributed between nurses and teachers. The reason why we have chosen this particular interview is because of the informant's, Stuart, dual role. Beyond being a teacher at a Danish primary school, he also holds the position as an IT instructor. In practice, it means that at a local level, he is a service worker responsible for the implementation of new technology and that he offers support to his teacher colleagues. As we will get back to in the analysis, his interpretations of technological breakdowns deviate from those of his colleagues, which analytically points us in the direction of the *multistability* of breakdowns. The pilot, from which our interview comes, resulted in a Danish research anthology, where breakdowns were highlighted as influential (Tafdrup and Hasse 2012), but not discussed and questioned in depth as we intend to do here.

The second empirical case we draw on is from an Australian university department, where master programs are delivered as online courses. The project from which the excerpts are taken is the doctorial study of one of the authors. The project focuses on the unforeseen changes that the implementation of online education triggers concerning the relation between academic teaching staff and the service provided by professional support staff. In addition to excerpts from two interviews, one with a teacher, Brian, and one with a supporter, Jason, we draw on ethnographic field notes.

Because we draw on data gathered from various contexts – data that was not constructed for the specific focus of studying breakdowns – we are methodologically settled within the field of secondary data analysis. Secondary data analysis means that we "include any data that are examined to answer a research question other than the question(s) for which the data were initially collected" (Vartanian 2010, p. 3). In our case, secondary data analysis has both strengths and weaknesses.

[1] Technucation was a research project that ran from 2011 to 2015 in Denmark (see Hasse 2017).

An evident weakness is that we are separated from the empirical field. This means we have not formulated the interview guides with breakdowns in mind, and we have not had the opportunity to pose follow-up questions. On the other hand, the definitive separation from the collection of data can also be seen as a strength. Breakdowns emerge as a theme within two detached projects and without the researchers involved having breakdowns formulated as an explicit focal point before entering the different fields. This makes the issue of breakdowns all the more prevalent, also across different educational contexts just as this theme came up throughout the *Technucation* data-material whether we analyzed nursing or teaching (Søndergaard and Hasse 2012; Hasse et al. 2015).

The predominance of interview data allows us to gain insight into how perceptions of technology interfere with the praxis of lifeworlds, as Wallace has argued:

> The interview is an opportunity to find out how technologies have had unusual or unexpected consequences or where complications or 'work arounds' tend to arise. (Wallace 2017, p. 63 – authors translation from Danish)

In other words, the interview offers a privileged perspective on how informants perceive experience and interpret a particular encounter with the technology and how the technology reveals the world as such for them. A breakdown is always a breakdown for someone, and the interview is a methodological way to reveal for whom a certain technology breaks down, when and why. The interview serves as a potential opening into a lifeworld, in which technology features as functioning and malfunctioning at times when it may surprise the researcher, because she has her own perception of what is considered a working and non-working technology.

8.3 Theoretical Background

8.3.1 Variations of Technological Breakdowns

Breakdowns are a well-discussed theme within the tradition of phenomenology. In *Being and Time*, Heidegger presents the now canonized example of the hammer in his tool analysis. Heidegger's ontological claim is that we primarily understand the hammer as a tool through our practical engagement in the activity of hammering and only secondary as an object perceived from a theoretical distance. It is through engaging in the activity of *hammering* that the specific mode of being Heidegger coins "ready-to-hand" [Ger. *Zuhandenheit*] reveals itself. Heidegger writes:

> The hammering itself uncovers the specific 'manipulability' [Handlichkeit] of the hammer. The kind of Being which equipment possesses – in which it manifests itself in its own right – we call 'readiness-to-hand' [Zuhandenheit]. (Heidegger 2001, p. 98)

Furthermore, this practical way of engaging in hammering, where the hammer appears ready-to-hand implies that the hammer as a delimited object is concealed. When the activity of hammering proceeds as an unproblematic flow of activity, we

are not specifically aware of the hammer as an object – it is withdrawn into the activity. It is only when the hammer ceases to function properly that we become aware of it as a delimited object. This marks a radically different mode of relation to the object that Heidegger coins *present-at-hand* (Ger. *Vorhandenheit*). When the hammer malfunctions, we are suddenly torn away from the activity and forced to consider what went wrong. When being present-at-hand, the hammer appears as a concrete object detached from practice. Heidegger's analysis of the hammer is, however, an abstract philosophical analysis. It is an ontological description of two modes of tool being – an analysis abstracted from any concrete empirical practices. When a given technological artifact breaks down in an empirically studied practice, the technological artifact is never "just" present-at-hand – it is present-at-hand in a, for the subject, specific way. Thus, the character of the breakdown is always tied to a specific situated consciousness that interprets the breakdown in a specific way.

8.3.2 A Phenomenological Step from Essence to Multistability

In the following, we will argue that Don Ihde's concept of how artifacts can have multiple stabilities can be used to elaborate this theoretical point. The core concept of this investigation is the postphenomenological notion of *multistability*. The term was introduced in Ihde's work *Experimental Phenomenology* first published in 1977 (Ihde 2012). The concept of multistability marks both an inspiration in and a break with the tradition of variational theory developed in Husserl's phenomenology. Husserl's famous argument is that through conducting the *epoché* (bracketing the *natural attitude* toward a surrounding world), it is possible to reach and determine the essence of conscious phenomena (Husserl 1973, p. 73). Ihde inherits the method of variational analysis but utilizes it to argue for a profound *anti-essentialism*. Ihde writes:

> In Husserl's earlier use, variations (originally derived from mathematical variational theory) were needed to determine *essential structures* or "essences." Variations could be used to determine what was variant and what was invariant. I also have found this technique invaluable in any phenomenological analysis—but as I used this technique, I discovered something other than Husserlian 'essences' as results. What emerged or 'showed itself' was the complicated structure of *multistability*. (Ihde 2012, p. 12)

To illustrate the multistability of phenomenal objects, Ihde utilizes the famous *Necker cube* (see Fig. 8.1).

According to Ihde, the cube is ambiguous due to the non-foundationalism of perception (Ihde 1990, p. 144ff). Dependent on the focus of the perceiver, the cube can appear from a lower left perspective or a higher right perspective. These two "appearances" can be understood as two distinct variations, none more foundational than the other. Although the Necker cube makes up a visual phenomenon, the concept of multistability is not restricted to the visual domain. Ihde's radical point is that every phenomenon can appear in several variations. The use of a technological artifact is always embedded in a situated techno practice that contains its own inter-

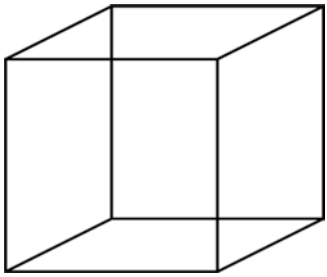

Fig. 8.1 The Necker cube. (Ihde 1990, p. 145)

pretative schemes. In other words: different situations allow for different uses of a technology. The knife appears as a cooking tool for the chef but a weapon for the murderer. Ihde's follower, the postphenomenologist Peter Paul Verbeek, formulates the point as follows:

> The insight that technologies cannot be separated from their use contexts implies that they have no 'essence'; they are what they are only in their use. A technology can receive an identity only within a concrete context of use, and this identity is determined not only by the technology in question but also by the way in which it becomes interpreted ... (Verbeek 2005, p. 117)

We argue that this point not only applies to functioning technologies but also to broken technologies. The broken technology cannot be understood as a phenomenon "in it itself." Rather it has to be understood as embedded in a concrete use context that allows for various interpretations of the technological breakdown. The breakdown itself is ambiguous because it is a multistable phenomenon with several variations. In the next section, we will elaborate this argument through an analysis of our two cases of technological breakdowns.

8.3.3 Situated Learning of Multistable Technologies

The postphenomenological concept of multistability emphasizes that there is no essential use of technological artifacts and that the use of these are subjected to change although a particular use might be stabilized for a longer or a shorter period. Based on these theoretical considerations, the relation between technological literacy and learning needs to be addressed. If technological artifacts are multistable, then it follows that the literate use of a given artifact cannot be learned once and for all by following standard procedures and reading manuals. Rather, the concept of learning we wish to invoke is more related to Lave and Wenger's terms *situated learning* and *communities of practice* (Lave and Wenger 1991).

In relation to the public sector, we can understand educational institutions as communities of practice where teaching is practiced. Although there are shared goals within a given community of practice (e.g., curricula, learning goals, giving pupils and students a formal education, etc.), there are also constant negotiations and reshaping of the practices that lead to these. The relations between practitioners

and technological artifacts take place within communities of practice. This calls for technologically literate practitioners that are sensitive to how techno practices are involved in situated learning processes that transform identity, social membership, and thus also the engagement with specific technological artifacts. The learners need to focus on learning, not just about technology, but technology in changing relations.

Despite being an inconvenient situation, technological breakdowns offer an opportunity for the practitioners to expand the knowledge of the community of practice that they are a part of. How is that? When a technology breaks down, the practitioner involved must conduct a situated analysis that involves asking questions like: "why did this technology break down," "how can it be fixed," and "which resources can I draw upon in order to go on with the activity." Finally, the situated learner must try to convey answers to these questions to his or her colleagues – and be open for shared knowledge debates of why this particular technology broke down and what can be done. In other words: he or she must be open for a collective learning process (Engeström 1987). Being used to ask and answer such questions will through time lead to the generation of a situated knowledge of techno practices. It will also lead to what we in our analysis refer to as a potent attitude toward technological breakdowns – an attitude that we in the analysis oppose to the impotent.

8.4 Analysis: Variations of Breakdowns

In this section, we draw on our empirical data to answer the questions: If breakdowns are multistable, what then characterizes some of the different stabilities or variations? How are they different and how may they contain a potential for learning? Our analysis points toward at least two different stabilities of breakdowns, which we term *the potent variation* and *the impotent variation.* As we will get back to in the discussion, both of these variations are related to the notion of technological literacy.

First, we identify what we name *the point break*. This is the point, when a breakdown emerges, when the technology moves from being ready-to-hand to present-at-hand. The position from which a point break is identified is first and foremost from the position of the actors in a field of practice. Stuart, the primary school teacher and IT instructor, talks about breakdowns as a general pattern that characterizes teaching practices in primary school:

> Stuart: With the position I possess, I am often ordered into other teachers' classes, because they cannot make it work. 'Can you please fix this?' they ask.

With reference to the phenomenological axiom that a consciousness is only consciousness insofar it is a consciousness o*f something*. Verbeek argues that technology is only a "technology in order to," which means it cannot be understood without reference to a practice. According to him: "What makes a tool or piece of equipment what it is, is that it makes possible a practice" (Verbeek 2005, p 78). We can apply

the same pattern of reasoning in order to understand Stuart's claim above. It only makes sense to speak of a broken-down technology insofar it has broken down for *someone*. Stuart is not called upon as IT service instructor because the technology is inherently dysfunctional, but because a teacher is unable to reach her/his educational aims through technology in the way it was expected. The structure of a point break relates as much to the perception of the technology as it does to the material configuration of the technology. This argument is manifested in Stuart's comparison of his own experiences with teaching of that to his colleagues:

> Stuart: "[It is not as common to myself]. However, I often experience others' teaching does not keep going, because they have switched a button on or off. Then I have to go, you know... [to help them]".

The immediate conclusion one is tempted to draw is that the technology coincidentally does not technically breakdown as much for Stuart as for his colleagues. However, the point we would like to stress, and which will be elaborated on as different variations of breakdowns, is that a breakdown is just as dependent on the practitioners' perception of it as it is on the material configuration of a technology. Thus, what might appear as a breakdown to one teacher does not do so to Stuart.

If we look at our second case, which is drawn from an online higher education context, an additional layer to what constitutes a point break emerges. On an unsuccessful attempt at running an online class, the academic teacher Brian states in the interview:

> Brian: "I had a problem at home, where I was sitting. Because when I dropped out, they [the students] kept talking to each other. But I wasn't even able to have an online chat."

Not only is the point break about the technology acting in unexpected manners for the teacher but it is also mirroring this in how other subjects – the students – experience the same situation. Through mirroring his experience with that of the students, the perception of the breakdown becomes intensified. This enables us to qualify the characteristics of a point break in education. Not only is it about the technology not working as expected *for the teacher* but also about how the same situation is perceived by others, e.g., the students or service staff. This emphasizes the profound relational and variational character of technology and that the stabilization of technologies is depending upon the context in which they are situated. If the actors within the situation affirm the teachers's perception of the technology as broken down, the obviousness of the breakdown is intensified. The magnitude of a breakdown is associated with the amount of people involved in and affected by it. Furthermore, the way in which people are associated with the breakdown may have educational consequences, as the case is here for the teacher, who apparently was the only who experienced the issue, resulting in a state of frustration, which we will get back to in relation to *the impotent variation* of breakdowns.

To sum up, we have argued that in order to identify a phenomenon as a technological breakdown, it has to be perceived as a breakdown of something for someone. There may well be a pen in your drawer with dried out ink, but it is not broken until you want to use it for something that involves writing (but you can use it to poke a

hole in a box). What is peculiar about education is that breakdowns are witnessed and become a social activity, through the students and pupils witnessing and taking part, and thereby the sense of a breakdown may be magnified. The major insight is that a breakdown is just as dependent on the perceiving subject as it is on the technology. This acknowledgement leads us to focus in the following on how breakdowns are also a matter of perception expressed through two variations of attitudes – the potent and the impotent.

8.4.1 The Potent Variation of Breakdowns

Now that we have identified two cases in which a technology, from the perspective of the teachers, is perceived as broken down, we can move on and ask how this is interpreted in different ways and lastly how this affects the breakdown as such? The first variation of a breakdown we name is the *potent.* Across our two cases, this variation of the breakdown emerges in the relation between the technology and those in the field who are concerned with instruction and support. By potent we highlight that the way the breakdown is perceived is characterized by a certain tolerance and sympathy and the breakdown is perceived as less obtrusive for teaching and more as an alternative condition that also can be dealt with. In our cases, the potent variation of the breakdown is found between the supporter and the IT instructor. Jason, a supporter in the university, where Brian experienced the breakdown of his online class, commented on the episode this way:

> Jason: Also, if he [Brian] was on wireless, his router might be in the kitchen or in the lounge. However, he was sitting in his office [at home], so he could have had a very low signal, and he probably was not aware of that.

Jason immediately interprets the breakdown episode, not as a breakdown of the teaching situation, the relation to the class of students, or lack of educational progress but as a problem of a certain technical setup causing a low internet signal, which subsequently affected Brian's connectivity. This approach of technical troubleshooting triggers a potent understanding of the breakdown, because it is perceived as the result of a logical sequence of events. Jason's attention is directed toward the history leading up to breakdown, rather than the future consequences it had. The breakdown also transforms from mystified to rationalized. Furthermore, this potency is associated with a sense of sympathy. Jason's interpretation puts him in a position, where he can explain and comfort Brian:

> Jason: "So we sat down with him [Brian] and talked to him about it, you know, [talked about] some of the issues and, just reminding him that these things happen with technology and it's very important to have a backup plan, and that sort of stuff. Just helping him deal with that, I guess."

However, the potent variation is not limited or tied to a certain organizational position within the school or university. Neither is it necessarily bound to a certain know-how about how the technology works. However, Brian afterward adopted a

more potent position based on the experience of breakdown and the service he received from Jason as he later reported in the interview. After he had been talking to Jason, Brian said:

> Ok, it didn't work. It does let us down. The point is that you learn from that [breakdown], and [then] you can put something in place.

We stated that the potent variation of a breakdown is not necessarily tied to technical expertise on how to fix the breakdown. This point is visible when we turn to the primary school IT instructor and teacher, Stuart. He says:

> Stuart: "And it's often about being lucky. Sometimes I have to reboot. It is often luck. It is by chance that I can make it work, right? It is rarely really broken down, and you cannot just destroy it like that […]. I do not experience often that my own teaching breaks down."

Whereas Jason started troubleshooting, Stuart adopts a method of contingency and coincidence, largely based on *luck*, as he says himself. The technology is not inherently broken as if a component was burned off on the motherboard, but rather the breakdown is located within the relation between teacher and technology. Although Stuart may experience technological breakdowns, his *teaching* rarely breaks down. This is because of his potent position. As he states, the reason why it breaks is not because he necessarily knows how it works, but because he is not afraid of touching the buttons and has experience with this practice of rebooting as a "lucky" strategy. Thus, the potent variation of breakdown is less critical in its educational consequences, and although it may relate to technical expertise, it can also be based upon luck and courage.

8.4.2 The Impotent Variation of Breakdowns

As explained, the origin of Ihde's concept of multistability is found in the phenomenological method of variational analysis. This method – in its simplest – is about observing a phenomenon from multiple perspectives, and what remains present from any vantage point is the essence of the phenomenon. In line with Ihde's anti-essentialist argument, we do not look for the essence of what a breakdown is. However, the method of having several perspectives on the same phenomenon guides us in our analysis and helps us analyze another stability of breakdowns, which we have coined *the impotent variation*. The impotent variation is in a dialectical relationship to the potent, in that those two condition each other. Not everyone can enact a potent variation, because potency is only considered *as potency* in relationship to the impotent.

By impotence, we figuratively address the immediate reactions that a breakdown often calls forth. Those reactions are often highly affective and characterized by a sense of mystery, stress, anxiety, paralysis, and frustration. This is exemplified in the interview with Brian, who reproduces his immediate reaction when the online class broke down:

> Brian: "For somebody who is really organized, that [the breakdown] is awful! That sense of 'Oh my gosh, I can't do anything about fixing this problem. I cannot. There's absolutely nothing I can do.' In addition, I look incompetent in front of my students. It is terrible, and I felt embarrassed afterwards, because I could not solve it."

The breakdown for the impotent rises as an unsolvable mystery that in the case of Brian, the situation cut him away from his students. The breakdown of the technology for the impotent often implies a breakdown of the teaching too.[2] Not only did Brian abandon the particular session, but as he states, through the breakdown the technology also interferes with how the students perceive him as a teacher authority. When the teachers have experienced several of such breakdown occurrences, it stabilizes for the teacher as a broken technology. Not because the technology does not work per se, but because it sabotages the goal the teacher wants to reach. Stuart, the primary school teacher and IT instructor use the word "anxiety" to describe the stability:

> Stuart: "But some have an anxiety to touch any buttons. However, if you have tried it a couple of times, then you know that nothing happens and you probably can get it up and running again."

Jason, the supporter, elaborates on the stabilization of the impotent position:

> Jason: "If you are trying to do something and you continue to experience issues and problems, you will start to get upset and you will not want to use that tool or continue those practices."

In opposition to the potent stability, the impotent one is directed toward the future rather than the past. The impotent attitude is concerned with how the technology – perceived as broken – will interfere with future teaching, rather than trying to understand what caused the past breakdowns and learn from that.

What is important here is that what it means to experience a breakdown is a relative matter. Neither Stuart nor Jason often experiences problems themselves, but that's because of their potency, where they have experiences with hitting buttons and luckily getting it fixed or rationally troubleshooting through the situation to identify, fix, or eliminate the problem.

8.5 Discussion: Breakdowns as a Path to Learn Technological Literacy

Although there might be an implicit valorization of and desire for educational practices with technology to be governed by what we have termed the potent variation of breakdowns, there might be reasons to dwell on the impotent variation. When the

[2] In the Technucation project, we had many other examples of impotence where practitioners (nurses or teachers) expressed frustrations similar to Brian's when their practice was interrupted due to technological breakdowns and they did not know how to deal with the situation (Søndergaard and Hasse 2012; Hasse 2017).

breakdowns are experienced as more radically disturbing the practice, this causes an impotent position which also contains a potential for learning about technological variations that are crucial to become a technologically literate practitioner. On the relation between breakdowns and learning, Koschmann et al. (1998) state:

> Opportunities for learning arise when the problem solver is unable to match the current problem to an existing model. In such circumstances, the application of previously learned abstract principles breaks down. (Koschmann et al. 1998, p. 39)

The impotent position seems close to the double bind position discussed by the anthropologist Gregory Bateson: a person is stuck in a dilemma with no solution unless learning to perceive the situation from a metaposition takes place (Bateson 1972, p. 276–277). This process of learning from frustration has later been developed by Yrjö Engeström as a process of expansive learning (1987) that takes place as "historically evolving contradictions in activity systems lead to disturbances, conflicts, and double binds that trigger new kinds of actions among the actors. In this sense, expansive learning is a historical reality rather than an outcome of a designed policy. On the other hand, it does make sense to develop and pursue policies that can make expansive learning less painful and troublesome" (Engeström and Sannino 2010, p. 18).

8.5.1 First Steps Toward a Policy Recommendation

Our take on technological literacy is that a policy is needed that makes it less painful for practitioners like Brian to move from the impotent to the potent position. This involves learning of the inherent multistability of technological artifacts, which will raise the practitioner's awareness that there is not one stable "right" way to deal with breakdowns. This allows for an approach that includes metaperspectives on situations and considerations over whether the agency needed is about the technology first or the activity toward which the technology should be a service. It also involves learning how to involve others in the situations of breakdowns (e.g., students or other technologies) as service can come from many different sources in the situation. Technological literacy aims at involving the available resources from the whole situation including the courage to press buttons (Hasse 2017; Hasse et al. 2015).

There is therefore a need for a policy that addresses how an organizational culture that encourages people to address conflicts and double binds associated with technology in a constructive – literate – way can be promoted. The multistability of technological artifacts requires an approach to techno practices that reckon that a standard technological solution for a given activity is not necessarily desirable. Rather than necessarily relying on standard procedures, technological literacy requires a human capability to act upon what Lave and Wenger (1991) call situated knowledge. This implies a hermeneutical skill set that allows the practitioner to interpret a techno-mediated activity and to make a judgment about how the use of a technological artifact can advance or obstruct the activity. An organizational culture

that supports and encourages practitioners to find their own qualified solutions to double bind – e.g., through collaboration and collective learning – fosters this kind of technological literacy.

8.6 Conclusion

The aim of this chapter has been to emphasize and explore the relational nature of technological breakdowns. We have done so with the point of departure in phenomenology and postphenomenology. First, we have explained technological breakdowns with reference to the Heideggerian notion of present-at-handness – it is only when the technological artifact is isolated from the actions of a practice that we perceive it as a delimited object. The way we perceive it is not, however, static. We have argued that due to technological artifacts' multistable nature, technological breakdowns are also multistable. Through empirical examples from two cases in the educational context, we have explored how breakdowns of concrete technologies are able to stabilize in various ways.

We have coined the theoretical distinction between *potent* and *impotent* stabilities. By the first concept, we understand a stability, which is characterized by a tolerant interpretation of the breakdown situation. This is often gained through either a rational approach, where the breakdown is interpreted as a sequence of certain technical events, such as a lack of connectivity. Nevertheless, the potent stability is not limited to a rational and technical understanding, as it can also be reached through a coping strategy based on the acknowledgment that sometimes things go in other directions than expected, and through luck one might rectify the course of the teaching that the breakdown has caused. The second stability we have named the *impotent* stability, where the breakdown is interpreted as a mystic event that profoundly obstructs the teaching. The breakdown leaves the subject as impotent and powerless and is often followed by highly emotional reactions, such as frustration and/or embarrassment.

In line with the concept of multistability, potence and impotence should not be read as an exhausting list of possible positions to take on a breakdown, but rather as a case of how differently a point break can be interpreted and perceived. Thus, the different stabilities are not the same as two typologies, but rather two patterns of actions, where the technology mediates and reveals the world in a particular manner.

Technological literacy, as Wallace and Hasse define (2014) it, requires sensitivity toward the multistability of breakdowns – an understanding of how breakdowns can be perceived from various perspectives. We have argued that the ability to cope with technological breakdowns is cultivated by being able to interpret technological breakdowns as multistable from a metaposition where the relational character of the breakdown and the activity in which it occurs are taken into consideration. Such considerations will in our view lead to a more nuanced and profound understanding of the techno practice in which a technological breakdown occurs.

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Part III
Analyses of the New Opportunities Provided by Digital Solutions

Chapter 9
Aging and Technology in Japan and Finland: Comparative Remarks

Kentaro Watanabe and Marketta Niemelä

Abstract There has been growing concern about aging and increasing needs for care services in our society. In the pursuit of independence and sustainable care for the elderly, emerging technological solutions based on ICT and robotics are expected to be essential. However, the integration of advanced assistive technologies into care services or the daily lives of elderly people is not straightforward. Moreover, the aging issue is a global one, and the solutions could be global as well. This raises the question how can we apply technological care solutions under different lifestyles, work cultures, and welfare policies in various countries and regions? In this chapter, we present the findings and remarks from a comparative study of Japanese and Finnish elderly care service systems, which was conducted as part of an international collaborative project called METESE (Meaningful Technologies for Seniors: Safety, Comfort and Joy). This study aimed to clarify the requirements and integration process of technologies in elderly care in these countries. We applied a mixed method approach, focusing on three types of stakeholders: the elderly, care personnel, and managers of care services. By combining and analyzing this data, we illustrate characteristics of elderly care and expectations for technologies in Japan and Finland from multiple perspectives. This analysis provides insights on how to integrate and harmonize technologies in different types of elderly care service systems.

Keywords Aging · Assistive technology · Service system · Elderly care

K. Watanabe (✉)
National Institute of Advanced Industrial Science and Technology, Tokyo, Japan
e-mail: kentaro.watanabe@aist.go.jp

M. Niemelä
VTT Technical Research Centre of Finland Ltd, Tampere, Finland
e-mail: marketta.niemela@vtt.fi

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9.1 Introduction

There has been growing concern about aging in our society. As the total number of the elderly increases, the number of those who require care in daily life also increases. The lack of a sustainable social welfare system due to limited resources is one of the major issues in our current society. Under this situation, emerging technological solutions based on ICT and robotics are expected to take an essential role in elderly care (Leroi et al. 2018; Obi et al. 2013). ICT for welfare has been considered to provide a potential solution to increase the productivity of care services. For example, electronic health records (EHR), care recording systems, and telecommunication and telemonitoring systems for care are among the major technologies. The evolution of the Internet of Things (IoT) and smart home technologies is accelerating this tendency (Siegel et al. 2014; Yang and Hsu 2012). Fall detection devices and systems to detect rising-up movements from beds are considered to increase the safety of the elderly (Miskelly 2001).

Moreover, care robotics have recently been drawing more attention. There are several types of applications, such as direct physical support of the elderly or caregivers (e.g., an exoskeletal device to assist walking or to support the back of a caregiver), smart physical assistance for daily life or care work (e.g., drug delivery systems), and social robots to communicate with the elderly for recreation or therapy (Kawamoto and Sankai 2005; Salichs et al. 2016). According to the research carried out on social robotics, some robotic devices such as Paro, a seallike animal robot, are considered effective even from a medical point of view (Shibata and Wada 2011). Assistive technologies are expected to be not only a solution to the challenges that current social welfare systems face but also a new business opportunity.

However, introduction of these technological solutions in elderly care is a cumbersome process. Although the number of available assistive technologies for the elderly is increasing, there is still a limited number of examples that have become internationally available in the field of elderly care compared to various types of prototypes and test cases resulting from R&D (Peek et al. 2016). There have already been various international studies on social welfare systems. International comparisons of the welfare systems (OECD 2005; Campbell et al. 2010; Rhee et al. 2015) provide insights for policymakers and care providers to make elderly care more sustainable and to increase the quality of care. However, there are very few studies available on how to increase the impact of assistive technologies in international settings.

To make the use of these technologies in harmony with the elderly's life and care work, it is not sufficient to think only about better functionality of the technologies but rather about how the technologies can be utilized in activities to provide services. Emerging technologies like ICT and robotics are powerful, but they are required to adapt to the life of the elderly, to the care work by personnel, and moreover to the social welfare system. In this sense, technology should be a part of the "service system," which consists of various types of stakeholders interacting with one another (Edvardsson and Olsson 1996). Technology integration based on the proper

understanding of an elderly care service system is a crucial process (Gallouj and Weinstein 1997; Windrum and García-Goñi 2008) that is important to share benefits from technology among different countries.

In this chapter, we present findings and remarks from a comparative study of Japanese and Finnish elderly care service systems.[1] We aimed to clarify the requirements and integration process of technologies in these systems. Japan and Finland are among the most aged countries worldwide, with different but relatively stable social and welfare systems. The comparison between them could provide knowledge about the utilization of technology for other countries which confront the challenges of aging.

We conducted a mixed method study, including interviews, questionnaires, and workshops with three types of actors who correspond to three major stakeholders in the field of service management (cf. Grönroos 1997). We investigated the elderly (especially active seniors), care personnel, and managers of care service organizations, using the aforementioned methods. By combining and analyzing the collected data, we illustrate the characteristics of elderly care service systems and the expectations for technologies in Japan and Finland from multiple perspectives.

We start this chapter by illustrating the state of social welfare and aging in Finland and Japan in Sect. 9.2. Then, we explain the research methods that were applied to each stakeholder group in Sect. 9.3. Section 9.4 shows the major results and findings from the studies. Based on these results, we highlight several key insights for the development and integration of assistive technologies in different types of elderly care service systems. Finally, we provide some highlights of the study as concluding remarks.

9.2 Aging, Care Services, and Assistive Technologies in Japan and Finland

9.2.1 Social Welfare Systems for the Elderly

In the global view, Japan and Finland are among the countries with the highest ratios of elderly people. According to the World Bank data (2018), Japan had the highest ratio of people above the age of 65 (27.0%), while Finland had the fifth highest ratio (21.2%) in 2017. Currently both countries are influenced by aging faster than other world, though the population sizes are significantly different. Both countries also have advanced and stable welfare systems but with differences. Table 9.1 demonstrates a summary of the welfare system for the elderly in Japan and Finland.

[1] This study was conducted as part of an international collaborative project called METESE (2015–2018), Meaningful Technologies for Seniors: Safety, Comfort and Joy. This project aimed at providing an integrative approach to develop, implement, and evaluate assistive technologies for the elderly and care work.

Table 9.1 Characteristics of elderly care in Japan and Finland. (Based on Watanabe et al. 2018)

	Japan	Finland
Population (year 2017)	126.8 million	5.5 million
Ratio of people 65 years and above (year 2017)	27.0%	21.2%
Elderly care system	Long-term care insurance	Nordic welfare model
Service charge	10% (20–30% if the income level is high)	Varies according to a municipality, service form, and service provider
Public expenditure for long-term care per GDP	2.0% (year 2014)	2.2% (year 2015)
Service providers	Mainly private	Mainly public
Freedom of choice	Large	Small but increasing
Role of the municipality	Insurer	Responsible for organizing services (the role has been under discussion with regard to the reform)

Japan has adopted a long-term care insurance policy as the main social welfare system for this population bracket (Hayashi 2014). This policy was activated in 1990 and is revised almost every 5 years (Shimizutani 2013). Every Japanese citizen at the age of 40 years or above is required to pay premiums for this insurance. When they turn 65 years old, or suffer from certain disabilities, they can become beneficiaries of the insurance. The elderly who need care and support should be assessed by the municipality where they live to clarify the amount of their need. The need for care is categorized into seven levels. For each level, the amount of financial support and types of care by the insurance are predetermined. The insurance covers 70–90% of the cost for care services (prevention care, home care, and facility care) and assistive technologies within the limit of the beneficiary's level of care needs, and the rest is paid by the elderly themselves. Most of the services are provided by private or nonprofit organizations. Facility care services can be provided only by organizations which are authorized by prefectural or municipal government. Under the national rule and regulation for care, these organizations provide welfare services.

In 2013, the Ministry of Health, Labor and Welfare (MHLW) adopted a new policy for elderly care called the "community-based integrated care system" (MHLW 2016). This policy promotes integrated support including prevention care, health care, and elderly care for the older residents in a certain region according to their need. Municipalities are required to organize such integrated services. The Japanese welfare system is facing a huge challenge especially in the shortage of caregivers. MHLW (2018) estimates that additional 550,000 caregivers are required in 2025 compared to the number in 2016. Though the Japanese immigration policy intends to accept more foreign caregivers, it is not clear whether the required number of caregivers could be obtained (Japan Times 2018).

Finnish elderly care is known as the Nordic welfare system. In this system, government and municipalities take the responsibility of providing required care for

each individual based on tax payments. When the elderly need care for their daily living, they are required to undergo assessment by the municipality. The difference between this system and that of the Japanese is that their care needs are not categorized, but the municipality decides required service and equipment for each beneficiary. Basic services such as home care and basic assistive technologies are provided for free. When the elderly enter a care facility, many of them are requested to pay a certain amount of the cost from their own pension or private fund, according to their property and income.

Care services in Finland are mostly provided by municipalities, although private service providers are increasingly participating in this sector. Even in cases when private service providers render assistance, a municipality procures their services and provides them to those who need them (OECD 2013). Recently, large municipalities have also started providing vouchers to support certain amounts of care cost for services (Anttonen and Karsio 2016).

Currently Finland is preparing a major reform for the social welfare system (THL 2018). One of the biggest changes under discussion has been the rearrangement of the county in a way to organize care services for several municipalities within it. The aim has been to both reduce the management cost for care services and standardize the quality of care. Another change under discussion has been the right to choose services. Under the new system, the elderly could choose their services by themselves, and the difference between public and private services would disappear. Since the reform is radical and causes strong public discussion, the activation of this new welfare system has proven to be difficult.

9.2.2 Policies to Promote Assistive Technology

In Japan, the development and introduction of assistive technologies, especially care robotics, are the major responses in policy toward a rapidly aging population situation. Since 2013, a national program called Robotic Care Equipment Development and Introduction Project was launched with funds by the Ministry of Economy, Trade and Industry (METI) and the Japan Agency for Medical Research and Development (AMED). The aim of this project is to assist and promote the development and commercialization of care robotics by technology companies. In this project, eight types of devices, including wearable transfer aids, non-wearable transfer aids, outdoor mobility aids, indoor mobility aids, toileting aids, bathing aids, monitoring systems for nursing care homes, and monitoring systems for private homes, were selected as development targets. These categories were also used for the subsidy program to obtain robotic devices for care. This program, which started in 2016, financially supported care service providers in purchasing devices that are in the aforementioned categories.

In 2017, the category of assistive devices was expanded to 13 items. New items include wearable mobility aid devices, devices predicting evacuation timing, devices to support care receivers in the series of motions required for evacuation, devices to

support communication with the elderly, and devices that collect and accumulate information involving nursing care services. In addition, MHLW and the Ministry of Internal Affairs and Communication (MIC) also conducted their own projects to promote the independent living of the elderly with assistive technologies.

In Finland, the care service system and its reform are heavily influenced by the general national level target to digitalize all public services (Ministry of Finance 2018). Advanced ICT and robotics are expected to have a significant role in the production of welfare services. The Finnish Government released on 2016 a government resolution of intelligent robotics and automation ("Valtioneuvoston periaatepäätös älykkäästä robotiikasta ja automaatiosta" 2016), in which social and health care was mentioned to be one of the primary application areas for robotics. In the following year, Ministry of Social Affairs and Health (STM) published quality recommendations for ensuring good aging and services in 2017–2019. In this publication, using technology was raised as one of the recommendations, in parallel to, e.g., developing housing services. In particular, the recommendation document mentioned robotics and automation as an enabler for new services for elderly people, in order to support autonomy and independency of older persons, improve services, and develop care work. The application areas were technology for smart housing (e.g., alerting and monitoring systems, social connection with telepresence, and home assistive robots), technology for elderly services (e.g., logistic robots, medicine deliveries, patient lifting and transfer), and resource planning (e.g., in home care).

A recent step toward the digitalization of the care service system is "The Well-Being and Health Sector's Artificial Intelligence and Robotics Programme," coordinated by STM (2018). The objective of the program is to speed up the utilization of advanced technologies (viz., AI and robotics) in four target areas: living at home, care and logistics in the hospital environment, pharmacotherapy and pharmaceutical service, and well-being coaching and rehabilitation. It is reasonable to state that in the near future, more research and innovation projects will be started as a response to these policy lines, to develop and integrate advanced assistive technologies in care.

To summarize, both countries conduct strong policy-level promotions of technology to be utilized in elderly care. Under this situation, we aimed at clarifying requirements for making assistive technology more harmonized in the elderly's life and care services.

9.3 Research Framework and Methods

9.3.1 Research Framework

As the analytical framework shown in Fig. 9.1, we adopted the service system perspective to clarify how technologies can be accepted in elderly care that promotes independent life (Watanabe et al. 2016). We analyze the differences between Japanese and Finnish elderly care service systems and their impacts and discuss how these differences will affect the integration process of assistive technologies.

Our theoretical starting point is the view on multiple actors in service systems (Gallouj and Weinstein 1997). Social welfare systems are organized and operated by multiple actors interacting with one another (Djellal and Gallouj 2006; Windrum 2013). In our study, we focus on *the elderly*, *care personnel*, and *managers of care service organizations* – these groups correspond to the main stakeholders in a service triangle (Grönroos 1997). With regard to the elderly, we specifically focused on the so-called *active seniors*: people over 65 years old, not yet undertaking major care services. They will become the users of care services and related technologies driven by the policies described in Sect. 9.2.2. Therefore, it is important to take their needs into consideration.

Our research interest covered the activities of each stakeholder, which include daily activities of the elderly, work practices by care personnel, and managerial activities by managers. In addition, expectations and challenges toward technologies were investigated based on the understanding on the activities of the stakeholders. In service research, technology is counted as part of the whole service system

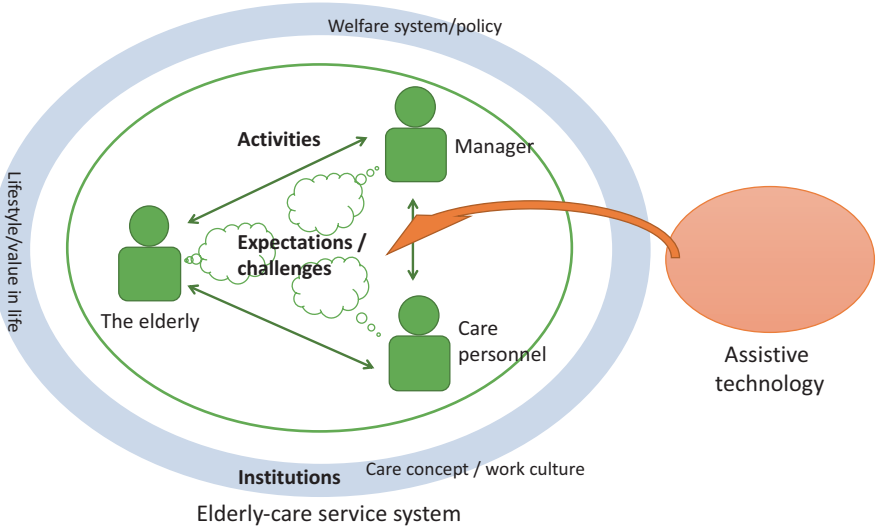

Fig. 9.1 Analytical framework

(Edvardsson and Olsson 1996). Only when services as activities are coordinated with the adopted technologies will those technologies be effectively utilized in the system. For this purpose, the previous research has suggested that the participation of users in technology development and integration is essential (Edvardsson and Olsson 1996). In our project, we adopted a co-design approach (Sanders and Stappers 2008; Steen et al. 2011) to clarify the requirements for technology integration.

Our framework also takes institutions into account. An institution is any formal or informal, implicit or explicit rule which influences people's behaviors and preferences. Policies and social systems are influential institutions to social welfare, but culture in life and work is also an important factor which could affect service practices and ways of living. Recently, institutions have been gaining more attention in service research, especially from the interorganizational or inter-actor perspective (Akaka et al. 2013; Vargo et al. 2015). We focused on the impact of institutions to the stakeholders, their activities, and their acceptance toward technologies.

9.3.2 Methods

Based on our theoretical framework, we applied a mixed method approach to get an overview of the multifaceted issue on integration of assistive technologies in elderly care service systems (Watanabe et al. 2017). Table 9.2 summarizes the research methods in relation with the analytical framework. The methods were applied in

Table 9.2 Research methods

Stakeholders	Research methods	Content (targets to be investigated)
The elderly	Questionnaire study Jp: N = 219 Fi: N = 115	A web-based questionnaire study about lifestyle, requirements, and preferences for care services and technologies (activities, expectations/challenges, institutions)
	Focus group interviews Jp: N = 8 Fi: N = 20	Interviews on acceptance, requirements, and challenges toward specific technologies introduced to the interviewees (expectations/challenges)
Care personnel	Work study Jp: N = 4 Fi: N = 7	A time-and-motion study of care personnel at care facilities (activities)
	Participatory workshops, interviews Fi: N = 5	Test use of a Japanese mobile communication system for care personnel in Finland and interviews on their acceptance and requirements toward the system (expectations/challenges, institutions)
Managers	Interviews Jp: N = 7 Fi: N = 7	Interviews on expectations and requirements about assistive technologies and challenges in introducing them into care services (activities, expectations/challenges, institutions)

both Japan and Finland in similar research settings for comparing the obtained results.

9.3.2.1 Methods for Studying the Elderly

The elderly stakeholder group was represented by the so-called active seniors (mainly healthy 65 + −year-old persons), who participated either in the questionnaire study or in the focus group interview.

- *Questionnaire Study*

A questionnaire was designed to study active seniors' current lifestyles, future care preferences, and general attitudes toward care services and assistive technologies (Miwa et al. 2017). The lifestyle questions included items about the respondent's social relationships, participation in volunteer work, daily activities, and use of technologies. The future care preferences included items about expectations for the desired caregiver and the type of care service. The assistive technology items included specific attitudes toward the use of various ICT and robotic technologies as part of the respondent's independent living or care and general attitudes toward using advanced technologies in society. Altogether the web-based questionnaire contained 20 questions (in this chapter we focus on five of them). The respondents in Japan (N = 219) were selected from a monitor group of a research firm and answered to the online questionnaire. In Finland, the respondents (N = 115) were invited to answer by sharing the web link of the online questionnaire on several elderly associations' mailing lists. Statistical analysis was applied to the data from both countries.

- *Focus Group Interviews*

A series of focus groups interviews (three in Finland, two in Japan) were carried out to gain qualitative, in-depth understanding of the perspective of active seniors toward ICT and robotic technologies as supporting independent living and care services. Altogether 28 elderly people, mainly active seniors, but in Finland also those who already received homecare services, were engaged in the 1–2-h focus group sessions to discuss about their needs and expectations for advanced technologies in their independent life and care. The focus group participants were selected in collaboration with local day care center service providers in Finland, and from an employment service center for older people in Japan. Three different applications[2] were shown in the sessions as illustrated presentations to demonstrate different aspects of advanced assistive technologies: (1) a depth camera for long-term monitoring at home, (2) a medicine dispensing robot supporting independent living, and (3) a digital reminiscence online service. The interview notes were analyzed on a qualitative basis.

[2] The selection of the technologies was based on the aims of the METESE project and its consortium partners developing these technologies.

9.3.2.2 Methods for Studying the Care Personnel

The participants in the stakeholder group of care personnel were professionals who directly provide care services to customers (i.e., the elderly). They participated either in the work study or the co-design process of an ICT application.

- *Work Study*

For obtaining basic information about the work of care personnel, we conducted a time-and-motion study (Miwa et al. 2018). In this work study method, an observer follows the target worker and records her/his tasks with timing, place, and other features during the work period (Pigage and Tucker 1954). In our study, we applied task codes for care workers developed by Miwa et al. (2015) and a tablet application for direct digital data recording. The study was conducted in one care facility in Japan and two care facilities in Finland. Altogether 11 practical nurses were individually followed during their work shifts. The facilities had a small number of residents (9–15) and provided 24-h care. The observation was held for 2 days at each facility. The data allowed both qualitative and quantitative analyses about the contents of care work in the two countries.

- *Co-design Workshops and Interviews*

The views of care personnel on the use of advanced technologies as part of their work was collected in two co-design workshops in Finland, in which the participants gave feedback and further ideas to develop a mobile communication system for care work (Fukuda et al. 2017). In Japan, the system ("DANCE") has been used at a care facility since 2014. DANCE allows care workers to communicate with colleagues using text, voice, photos, movies, and drawings (Fukuhara et al. 2013), in order to make hand over of information about the daily work and care receivers more efficient. In the workshops, five Finnish participants tested the system specifically using the photo and video features while considering their working environment. Afterward they were interviewed about their impressions of the technologies, its potential use at work (both for themselves and for care work in general), and the limitations of the system. The first group included two practical nurses from a private care facility. The second group, with three nurses, was from a home care service held by the municipality. The interview notes were analyzed on a qualitative basis, and its result was compared with the experience in Japan (Fukuda et al. 2015; Fukuda et al. 2017).

9.3.2.3 Interview Study of Managers

Managers at care service providers are the third stakeholders investigated in this study. Altogether 14 managers (7 in both countries) were individually interviewed about their views on elderly care services, their expectations toward assistive technologies, and the challenges faced in implementing them (Watanabe et al. 2018). The interviews were qualitatively analyzed.

9.4 Results

9.4.1 The Elderly

9.4.1.1 Questionnaire Study

Our questionnaire produced an extensive empirical material. In this chapter, we concentrate on those results that we consider most central for the Finnish-Japanese comparison. We include the results concerning the preferences for (1) primary caregiver, (2) care service, (3) willingness to use certain ICT and robotic technologies, and general attitudes toward technology (4) in personal life and (5) in society.

Many of the Japanese participants preferred their spouses as their primary caregivers, while Finnish participants preferred care professionals (Fig. 9.2). More than 60% of Finnish participants preferred home care, while the Japanese respondents preferred facility care as much as home care (Fig. 9.3). These results imply that for the Japanese elderly, the expectations tend to leap from family-based care to facility care directly. Both respondent groups expected care at home, but the desired caregiver and so the expected type of care service were different.

The Finnish respondents were more willing to using care support technologies (e.g., walking support, washing and toiletry support, mobility and transfer support, medicine taking support, dementia preventing games) for both their independent living and care services for themselves than the Japanese respondents. Only social robots were more preferred by the Japanese group. Two thirds (67%) of the Finnish

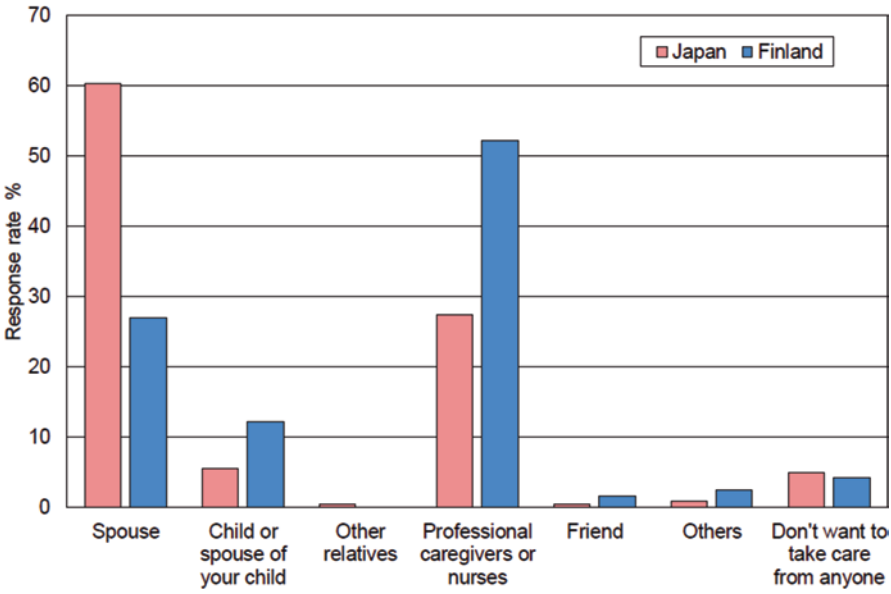

Fig. 9.2 Expected primary caregiver. (Miwa et al. 2017)

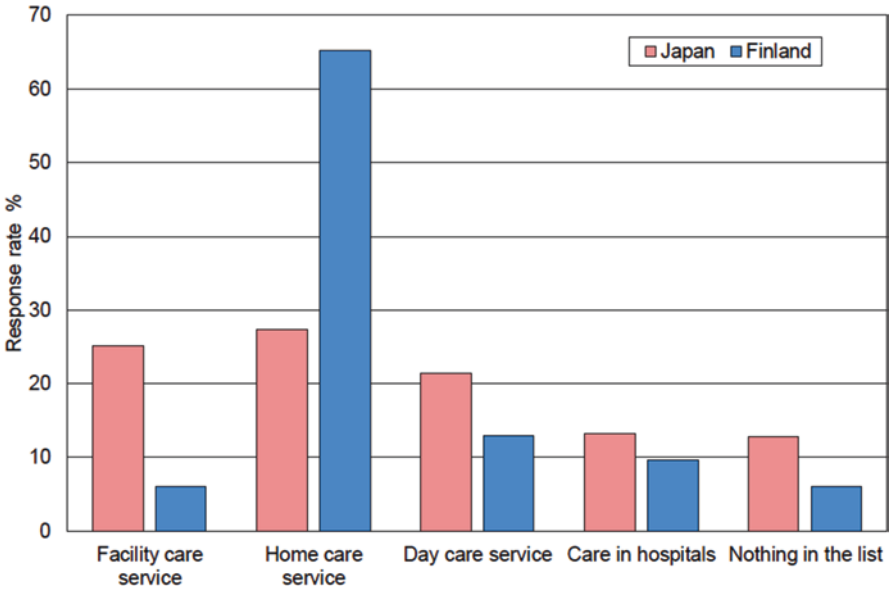

Fig. 9.3 Expected care service. (Miwa et al. 2017)

respondents expected advanced technologies such as robotics to become more necessary to themselves in the future, while about 53% of the Japanese respondents thought the same. On the other hand, a bigger proportion (86%) of Japanese seniors perceived the distribution of advanced technologies such as robotics to be good or very good for the society, while 70% of the Finnish respondents agreed on this view (Niemelä et al. 2017).

9.4.1.2 Focus Group Interviews

We could identify some interesting similarities and differences between the Finnish and Japanese groups with regard to the three care technologies demonstrated in the focus groups. The elderly participants in both countries had challenges in understanding the depth camera monitoring system and its automated data analysis for long-term purposes (e.g., to identify gradual or sudden changes in activity, posture, and so on). On the other hand, they easily understood the use of the system to monitor falling and emergency situations, which was taken to be a necessary as well as acceptable purpose for the system. In both countries, the interest in personal use of this system was moderately low.

The medicine dispensing robot was reasonably liked by all focus groups. Participants found it useful to be reminded of taking medicine in time, especially when living alone. The Japanese seniors liked certain functionalities, such as the

system speaking when it was time to take the pill. The Finnish participants perceived the technology as needful but were less interested in personally using it.

The Finnish senior participants found the digital reminiscence service interesting, especially for storing their memories and family history for their grandchildren and future generations. Some memories could be public, for instance, those which are related to major occurrences in the society such as war (photographs and stories of wartime). Also, old family traditions were considered important. The Japanese groups were more unsure about using digital reminiscence, and they seemed not to be that much interested in sharing family history or past historical events through the service. However, one of the Japanese groups found the service good for sharing memories of the local community and how it has been changing.

Overall, in both countries monitoring daily activities seemed to be less acceptable than monitoring for alert situations, which was found useful. The reminder technology was high in acceptability as well, and Japanese seniors may like such systems to be more interactive (with speech) than Finnish ones. The technology supporting social and community reminiscence was perceived differently in Finland and in Japan, which highlights influences of culture and history in elderly people's willingness to use technology.

9.4.2 Care Personnel

9.4.2.1 Work Study

Based on our observations, the tasks of care workers can be categorized into two groups: direct tasks for care recipients and indirect tasks. Figure 9.4 shows the time-share of these categories per day in the target facilities. Although the detailed activities in each facility have considerable differences, the rates of larger categories demonstrate the similarity between the countries: in all cases, grossly half of the work shift is used to direct tasks and the other half to indirect tasks. In addition, tasks linked to information sharing and recording within the indirect tasks also have almost the same share in Finland and in Japan. This is an interesting finding, because the Finnish care facilities utilized PCs for information sharing, while the Japanese care facility did not use any ICT systems for care.

9.4.2.2 Co-design Workshop and Interview

In the workshops, several expected usages of the DANCE communication system for care professionals were suggested, such as recording the physical status and healing process of care recipients, reporting the situation of an incident and communication with families (e.g., showing an elderly person's smile to his/her family). Some of the usages such as an incident report were observed also in Japan (Fukuda et al. 2015, 2017). Meanwhile, a different type of usage was also taken up,

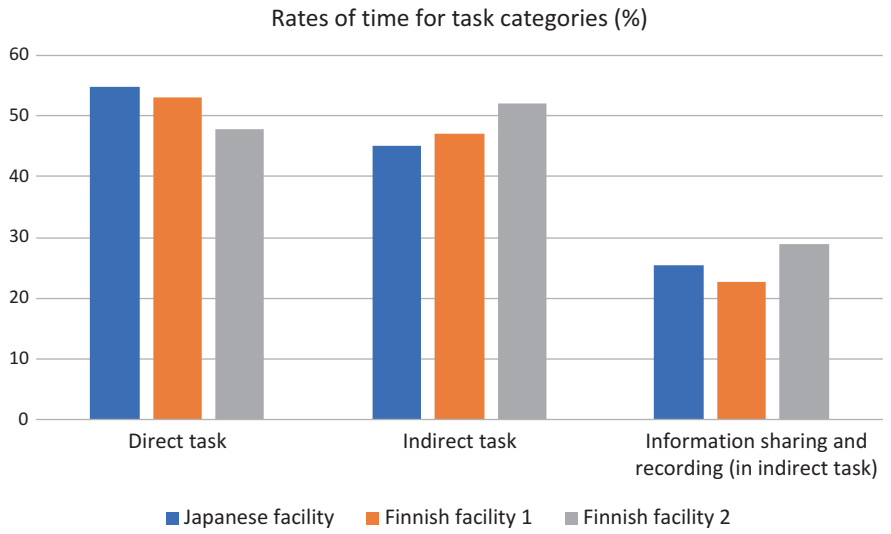

Fig. 9.4 Rates of time per day for task categories. (Based on Miwa et al. 2018)

such as recording the place of medicine at home. Such a situation-oriented usage is important for the technology to be adapted to each country or service. As the concern for the use of DANCE, the elderly's privacy was mentioned in both workshops in Finland.

9.4.3 Managers

A notable result from the manager interviews concerned the perceived challenges in the introduction of technologies (Table 9.3). Although there are different care policies and services, many of the common challenges were mentioned in both countries. These challenges included changes to workflow as a result of the introduction of certain technologies, a "care-by-hand" culture, privacy, the cost of technology, the lack of maturity of the technology, and weak impact on management.

There were also some differences about the level of these challenges. The "care-by-hand" culture mentioned in both countries does not seem to influence the acceptability of specific technologies equally. For example, patient lifts were accepted more often in Finland and communication robots accepted more often in Japan. The differences in acceptability may be explained by the differences in each culture's conception about what human beings should and should not do. The priority on safety of care professionals and various other factors may also affect these differences.

In addition, the impact on management was considered to be weak in both countries, at least from the financial perspective. Meanwhile, Japanese interviewees

Table 9.3 Challenges in integrating assistive technologies into facility care services. (Watanabe et al. 2018)

Challenges	Japan/Finland
Change in workflow	Both
Immature technology	Both
"Care-by-hand" culture	Both, with different views between Japan and Finland
Public perception of robotics	Finland
Privacy	Both
Cost of technologies	Both
Weak impact on management	Both but with a positive view in Japan

expected the role of technologies to reduce the burden of care professionals, which could ease the recruit of new workers. This idea stemmed from the severe pressure on the labor market of care professionals in Japan. The social situation also affects the acceptability of certain technologies.

About the currently used technologies, the care information system installed in Finnish municipal care service organizations seemed more standardized across municipalities than in Japan. In Japan, each care service provider has the responsibility to provide services and to install the necessary technology by themselves. Therefore, the systems are not necessarily common among Japanese service providers. Another interesting observation was that many of the managers in Finland described their facility as the "home" for the elderly. They highlighted the freedom available in the facility, such as less restrictive schedules and freely arrangeable individual rooms. These were not strongly emphasized in the interviews with the Japanese managers.

9.5 Discussion

9.5.1 Similarities in Elderly Care and Technology Between Japan and Finland

The results of our studies revealed a considerable number of common characteristics in the elderly care service systems and in the opinions of the respective stakeholders in Japan and Finland. These commonalities were observed specifically in the views of care personnel and managers. Facility care managers highlighted the common challenges of technological integration, in particular. Challenges such as immature technology, cost, and weak impacts, stem from the limitations of current technologies. Change in workflow that occurs when applying technologies is a general and practical challenge reported in various studies on organizations and human-computer interaction. It is the reason why the participation of main users is important in technology development and integration. The workshops with care personnel

resulted in relaying the effective usage method of the communication system for each service context. Results showed that the ideas from expected users make the system's application more practical. An important point is that the design process should hold in mind the user's activities, and not only the technology's functions.

The privacy issue was mentioned in the interviews of managers in both countries. It was also mentioned in the co-design workshops in Finland. Privacy is an issue that arises from a sense of value. Some common values, which nowadays are often shared globally, affect the acceptance of technology, making the opinions and attitudes more similar.

The results of the work study showed a similarity in care work on a fundamental level. The proportions of major categories of care tasks were not substantially different in Japan and Finland. The major needs for care were based on activities that sustain life, which include eating, excretion, sleeping, and bathing. The fact that the required tasks related to care are largely similar in various countries is a good basis for technology companies to provide assistive technologies. It is also interesting that the use of ICT at care facilities did not remarkably change the time used for information sharing and recording. Though the samples of this study were limited and did not include measurement of the quality and quantity of the information shared, this finding indicates that the implementation of ICT does not necessarily increase the time efficiency of care work.

In summary, basic care practices, management concerns, and stakeholder relationships showed common features in the service systems of both Japan and Finland.

9.5.2 Differences in Elderly Care and Technology Between Japan and Finland

There are also substantial differences between the service systems of the two countries. The study on active seniors revealed a significant difference concerning the expectations on the primary caregiver. Most Finnish active seniors thought that a care professional is the primary caregiver; this view represents the defamiliarized nature of elderly care (Solheim 2014). On the contrary, Japanese active seniors expected their spouses to be primary caregivers, which demonstrates the changing but still existing culture of elderly care. In traditional Japanese family caregiving culture, the wife of the eldest son was expected to be the primary caregiver of her father- and mother-in-law (Campbell 2014). However, the number of responses that indicated the expectation that their children's spouse should be the primary caregiver was very small. This finding reflects a change in the premises of traditional family caregiving and is due to the decrease of the number of two- and three-generational households and the marriage rate (Wakui 2016). The change has taken place drastically within a decade, and the expectations toward spouses illustrate the importance of the societal, policy, and technological support for them and more broadly family caregiving.

A result from the questionnaire study adds another dimension to the analysis of the expected type of care service and the use of technology. Finnish active seniors preferred a professional home care service, which indicated a larger inclination toward independence than that of the Japanese elderly. In Finland, there is a demand for care services that support independent living at home, and the current policy seems to fit to this demand. On the contrary, in Japan, facility care is not an unpopular option – it is a practical option when family support is unavailable or difficult to organize.

The expectations of the elderly seem to influence other stakeholders. The Finnish managers' emphasis on their facility as the "home" for the elderly reflects the willingness of their customers to be independent as much as possible. Social policy and the welfare system have also had an impact on service systems and technology acceptance. Compared to the Finnish case, in which municipality is currently a major actor in providing care services, it is more difficult in Japan to install a common system to different care service providers.

9.5.3 *Implications for Technology Integration in Elderly Care Service Systems*

Figure 9.5 summarizes our findings about the relationship between an elderly care service system and assistive technology based on the results of this study. Finland and Japan share the basic care needs, practices in care work, and the management based on medical, physical, and cultural commonalities. They provide the fundamental requirement for assistive technologies as basic functions, such as watching over the elderly at night, lifting them from a bed to a wheelchair, and sharing incident information at a care facility. This ensures that assistive technologies

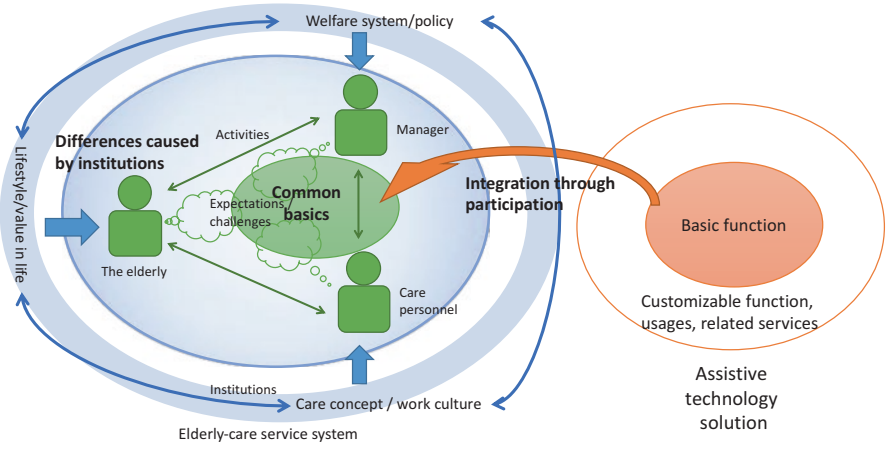

Fig. 9.5 Implications of the study mapped in the analytical framework

related to basic needs in life and care work are meaningful in a number of different elderly care service systems. Meanwhile, care needs, practices, and managements are differentiated by institutions, based on the lifestyle, care work culture, and social welfare policy. These are not separate but related to one another. They also cause differences in the strategy of technology integration: examples are the emphasis on independent living in Finland and reducing the burden of care personnel in Japan. To adjust to such different aspects of elderly care service systems, the customizability of the technology should be secured. In addition, it is also necessary to rearrange technology usages and related services. In this way, assistive technologies can be made as genuine solutions in the service system.

The relationship between institutions, service systems, and technologies has been illustrated in the earlier research (Djellal and Gallouj 2006; Windrum and García-Goñi 2008; Watanabe and Mochimaru 2017). The results of this study confirm the argumentation of the earlier research and extend it to international comparisons of care service systems.

This study also highlights the importance of surveying local elderly care service systems from the perspectives of various stakeholders and institutions. It is not sufficient to study the needs of single users, including the elderly and care personnel, but their activities and interaction with other stakeholders should also be in the spotlight. The elderly care service systems and related institutions should not be observed as a static system, but rather as a dynamic entity that evolves through interactions with stakeholders. As shown in our interview study with active seniors and managers of care facilities, the acceptance of individual technologies can be different in different contexts. The user participation, which was conducted in the workshops, provides a good illustration on how assistive technologies and the respective service can be changed.

9.5.4 Limitations of the Study

While this study provides a diverse view on elderly care service systems, the samples of country-specific studies were quite small. The study of various aspects included, such as the requirements of the elderly and the service processes of care personnel, should be supplemented through further research. In addition, the comparison was only made between Japan and Finland. It is possible that there are concealed prior conditions which only exist in these countries that may affect the generalizability of the insights derived from this study. A comparative study in other countries is needed to obtain more general results.

This study emphasizes the importance of a mixed method approach to understand the service system in an integrative manner. However, this method is costful for practitioners to apply to the technology development and integration for individual local markets. One solution is to nurture the local service business to integrate assistive technologies into elderly care. This could be an important knowledge-intensive business service in the field of elderly care.

9.6 Conclusions

This chapter has compared the Japanese and Finnish elderly care service systems in order to examine how technological development and integration can be made more adaptive and harmonized in the service systems for the elderly. While the similarities in daily activities of the elderly, care work, and management activities can ensure certain required functions for assistive technologies, it is important to also recognize differences in elderly care service systems and to adapt assistive technologies to such differences – the participation of stakeholders is a preferable method here. Influences of institutions, including lifestyle, work culture, and care policy, need to be carefully analyzed when integrating assistive technologies into elderly care.

The approach we adopted in this study is applicable in other types of elderly care service systems. We will extend this approach to different countries to contribute to the sustainability of elderly care service systems and values for the stakeholders.

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Chapter 10
Robots as Social and Physical Assistants in Elderly Care

Marketta Niemelä and Helinä Melkas

Abstract Care robots are robotic applications targeted for use in care and nursing environments, or to support independent living for the elderly and those with disabilities. Robots may provide relief to the challenge in many countries of tending to an increased elderly population's needs for care services. This chapter provides an introductory review of care robots and discusses their acceptability within the field of elderly care. Our focus is on the end-users of robots, namely the elderly and care professionals, who are often neglected or misconceived within the field of technology development. We approach their perspective through three empirical studies: a citizen panel for older adults on their expectations and concerns for care robots, a case study of a social robot adopted within three elderly-care facilities, and a case study of a mobile telepresence robot piloted in two care facilities. In these studies, both elderly people and professionals showed positive perceptions towards care robots, at least from certain perspectives. They also presented requirements and framework conditions that should be taken into account when considering the use of robots in care. In particular, the study participants highlighted the priority of humans in care, although they accepted robots for carrying out secondary care tasks.

Keywords Care robot · Acceptability · Elderly care · Citizen panel · Telepresence robot · Social robot

M. Niemelä (✉)
VTT Technical Research Centre of Finland Ltd, Tampere, Finland
e-mail: marketta.niemela@vtt.fi

H. Melkas
Lappeenranta-Lahti University of Technology LUT, Lahti, Finland
e-mail: helina.melkas@lut.fi

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10.1 Introduction

Within the last decade or two, technology developments in certain areas – including computation, network and communication technologies, localization, machine vision, sensors and mechatronics, among others – have advanced to the point that robots are now becoming feasible and available for use in homes and workplaces, beyond factory floors and public settings. The development of robotics is often perceived as being so promising that policymakers in many countries that face the challenge of a growing elderly population have seriously begun to investigate how robots could be used to alleviate care work and to help the elderly at home (e.g. Swedish government, 2018[1]; Finnish government, 2016[2]; 'New Robot Strategy' of Japan, 2015[3]). For instance, the European Union's ageing society is a central challenge in which robotic technology could play a pivotal role in reducing the burden on younger people and the state.[4]

Care robots are not a homogenous category of technology; instead, they come in many forms, sizes and purposes. A 'robot' is a physical object that can move and potentially manipulate the physical world and has at least some degree of autonomy.[5] Care robots may appear as boxlike machines, or they can be human shaped or wearable, such as robotic 'power suits' for care workers. As formulated by Goeldner et al. (2015, p. 115), the field of care robotics encompasses 'all machines that operate partly or fully autonomously performing care-related activities for people with physical and/or mental handicaps'. The elderly and care professionals can use care robots as part of their service or work.

A number of robotic applications are currently being developed and tested (and in some cases have been permanently adopted) for the purposes of social and healthcare. Table 10.1 lists several central application areas and typical uses of robots in welfare services. Robotic assistance may be helpful for simplifying activities of daily life for elderly and/or handicapped people; increase users' quality of life by giving them more autonomy (Herstatt et al. 2011); or increase their safety or perform tasks with a certain quality standard, such as serving medication (Goeldner et al. 2015). Examples of 'typical' personal-care robots or robotic devices for the

[1] The Swedish government's committee directive 2018:82 (2018). https://www.regeringen.se/4a38da/contentassets/038d2f97ae9d475b97d1fe318fca236a/valfardsteknik-i-aldreomsorgen-dir.-2018_82.pdf

[2] The Finnish government's resolution on intelligent robotics and automation (2016). http://valtioneuvosto.fi/paatokset/paatos?decisionId=0900908f804c7484

[3] 'New Robot Strategy'. Japan's robot strategy – Vision, strategy, action plan (2015). http://www.meti.go.jp/english/press/2015/pdf/0123_01b.pdf

[4] Strategic Research Agenda for Robotics in Europe 2014–2020 (2014). https://www.eu-robotics.net/cms/upload/topic_groups/SRA2020_SPARC.pdf

[5] ISO 8373: https://www.iso.org/obp/ui/#iso:std:iso:8373:ed-2:v1:en. Sometimes purely non-physical computer-based assistants – such as so-called virtual agents or artificial intelligence software solutions that perform routine assistive tasks on computers – are termed robots as well, although nonphysical robots are beyond the scope of this chapter.

Table 10.1 Typical uses of robots in welfare services (Kyrki et al. 2016; ROSE consortium 2017)

Application area	Application (*not yet commercial)
Medical care	Surgical robots
Robots in institutional settings, especially logistics	Hospital pharmacies
	Internal logistics in hospitals
	*Lifting patients
Rehabilitation and prostheses	Robotlike rehabilitation devices
	Prostheses
	Exoskeletons
Personal physical assistance	Eating (e.g. robotic spoons)
	Mobility
	Lifting and carrying objects
	Cleaning
	*Cooking
	*Dressing
	*Hygiene
Personal cognitive and social assistance	Support for self-care (e.g. motivation to exercise)
	Companion robots
	Support for interaction (e.g. telepresence)
	*Cognitive support (e.g. reminding/memory aid, finding objects)

elderly include therapy-animal robots such as 'Paro' (Wada et al. 2004, 2009), telepresence robots such as 'Giraff' (Coradeschi et al. 2011), robotic walking support devices such as 'Lea'[6] and wearable walking-assistance devices such as 'Honda'.[7] For care professionals, robots provide a similarly wide variety of assistance to relieve physical burdens and to increase the efficiency of care work. For example, there are wearable robots to support physiotherapeutical rehabilitation, such as 'Indego'[8]; medicine-dispensing robotic devices for home care, such as 'Evondos'[9] (Rantanen et al. 2017); patient-lifting and transfer robots, such as 'RIBA' (Mukai et al. 2010); and a variety of logistics robots that can carry equipment and supplies for care workers.

Although robotic technologies can potentially enable a large variety of different applications, their introduction and adoption in actual elderly care appear to be painfully slow. Few care-robot products are on the market; some of those have enjoyed commercial success, but much robotic technology is still in the development phase. For example, in Bedaf et al. (2015) review study on care robots for supporting independent living among the elderly, the authors identified only six commercial products among 107 robots that had been developed for the elderly.

[6] https://www.robotcaresystems.com/

[7] https://world.honda.com/Walking-Assist/

[8] http://www.indego.com/indego/en/home

[9] https://evondos.com/

Many of the products in development could be described as technology-development platforms that lacked a commitment to get the product on the market. Developers have also tended to tackle issues that are less relevant to the actual elderly users themselves. For instance, the study found that robots were less developed to support physical mobility, self-care, and social relationships (the support the elderly often need); more often, robots were developed to support non-physical tasks such as reminding, monitoring, conducting health measurements and entertaining (Bedaf et al. 2015). In these kinds of tasks, the physical power and dimensions of robots tend to be underutilized.

One significant challenge to date in the development and commercialization of robots for elderly care has been their relatively low social acceptance. For instance, in a EU28-wide survey (Special Eurobarometer 427, 2015), citizens' attitudes towards robots in general were found to be quite favourable; approximately 64% of respondents perceived robots positively. Their attitudes towards robots that are used for care purposes (i.e. providing 'services and companionship') were less positive: fewer than 50% of Europeans were comfortable with the idea that robots could provide services and companionship for elderly or infirm people; see Fig. 10.1. Older age groups tend to exhibit lower acceptance than younger groups; only 25% of people 55+ were 'totally comfortable' with the idea of care robots, compared to 37% of young people aged 15–24 (Special Eurobarometer 427, 2015).

Some studies, in contrast, have shown high levels of acceptance of robots if they are used to help people to regain independence when they are old or handicapped (Arras and Cerqui 2005) or if the robots can help in daily household routines or tasks such as heavy lifting and cleaning at home (Ray et al. 2008). According to Broadbent et al. (2009), older people themselves are typically less willing to accept robots in general but are more positive about robots that provide independence and respond to older people's needs, for instance, the need to compensate for the loss of cognitive abilities. The authors identified several factors, both demographic and robot related, that influence older adults' willingness to use care robots. The factors

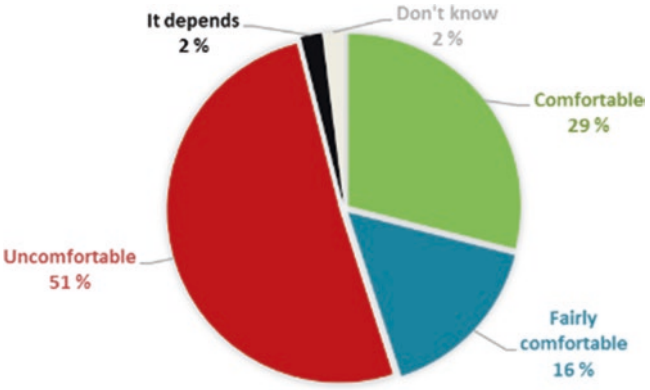

Fig. 10.1 European citizens' perceptions of care robots, according to Special Eurobarometer 427 (2015)

include age and gender; men are typically more positive towards robots than women (see de Graaf and Ben Allouch 2013), although Shibata et al. (2009) have found that women favoured interactions with Paro, the therapy seal robot. Other factors that reportedly influence acceptance include the person's cognitive ability, experience with technology and robots and education and cultural background; for instance, those who have experience with robots will have more positive attitudes towards them (Turja et al. 2018).

The way in which healthcare professionals perceive care robots is also a significant factor. Turja et al. (2018) studied Finnish healthcare professionals' acceptance of and experience with robots and compared them to the general Finnish population. They found that the healthcare professionals had less experience with robots and more negative attitudes towards them than the general population, although they welcomed robot assistance for certain healthcare tasks, such as heavy lifting and logistics (i.e. ergonomically challenging work). They also perceived tasks that are secondary to the actual care or human-centred work, such as sorting, shelving and delivering materials, as being suitable for robots. The authors noted differences in acceptance among occupational groups of nurses (Turja et al. 2018). Practical nurses stood out as having the most reserved attitudes towards robots, which may have been due to their relatively lower educational level or fear of job loss.

Considering the importance of older adults and care professionals – both of whom are stakeholders of the use of robots in elderly care – these groups are seldom engaged in the development and assessment of the technology. This seems to be problematic, especially with regard to the elderly themselves. Research on care robots, for example, relies largely on somewhat stereotypical views of older people as lonely, frail and incapable (Frennert and Östlund 2014; Parviainen and Pirhonen 2017; Neven 2010). Robotics engineers tend to view the elderly as a weak and deficient group of users (Compagna and Kohlbacher, 2015), the needs of whom are assumed rather than heard (e.g. Røtnes and Dybvik Staalesen 2009). If diversity among older users is incorporated at all, it is most often only in terms of age and gender differences (Flandorfer 2012). Current robotic solutions for the elderly are mostly 'technology push' innovations (Taipale et al. 2015). It also appears that diversity among professional caregivers (Turja et al. 2018) is not sufficiently taken into account in the research, development and integration of care robots. Care workers may be seen as incapable of assessing innovative technology (Compagna and Kohlbacher 2015), and technology-push innovations may cause novel types of problems in coping at work (e.g. Melkas et al. 2016). The impacts of technology usage, or the prerequisites for successful, effective application of technology, have been scarcely investigated in a comprehensive manner (Melkas 2013).

Overall, the field of care robotics from a nontechnical perspective is still an emerging sector of research (e.g. Pfadenhauer 2013; Karim et al. 2016; Broadbent et al. 2012; Smarr et al. 2012). Technical possibilities, limitations and targets tend to rule the development, and researchers and developers seldom take into account (1) the perspective of the actual end-users and their needs, (2) a view of care services and organizations as social systems and (3) the societal culture and system of care. For instance, Šabanović (2010) argues that when social issues are invoked to

motivate robotics research, these issues are quickly subsumed by discussions of technological possibilities and concerns.

In the field of human-robot interaction (HRI), a few researchers have pointed to a need to take HRI studies out of the laboratory and 'into the wild': into real-world settings and multi-person contexts (Jung and Hinds 2018). According to Frennert et al. (2017), research on how humans interact with robots is still primarily carried out in laboratory settings with student participants. Although controlled laboratory experiments are crucial to the development of HRI, more 'in situ' robot studies should be conducted in their intended natural environments in order to provide insights into how people experience robots and how robots become embedded and used in people's everyday lives. Observing and analyzing HRI in real-life situations provides an understanding of how robots fit in and change social structures in the environment in which they are used (Jung and Hinds 2018) and of how people may invent new ways of using them. Daily life and work in care homes (for instance) does not always proceed in a 'controlled' way; clients' health conditions may change quickly, hence affecting the person concerned, care professionals and other clients. Engaging both older adults and care professionals more in the development process and as actual users in order to assess care robots in real-use environments could also help in gaining social acceptability for robots.

In this chapter, we highlight older adults' and care professionals' perspectives on care robots through data collected within three empirical studies: a citizen panel of older adults on the roles and requirements for robots in their future lives and care, as well as two case studies of actual usages of a telepresence robot and a social robot in nursing-care homes. We are interested in the expectations, experiences and impacts of robotic care in general and social robots in particular, as perceived by older adults and care professionals. Social robots are robots that are developed to communicate with humans in natural, intuitive ways and in a human-like manner (Kirby et al. 2010). One central purpose for social robots (or socially assistive robots) is to enhance the health and psychological well-being of the elderly by offering them companionship (Broekens et al. 2009). Although social robots are just one group of care robots, and their use is still a new approach in elderly-care services (Ott 2012; Compagna and Kohlbacher 2015), they likely have the largest potential to cause radical changes in social relationships and structures in care contexts; we thus should pay attention to them now, during their early development.

10.2 Empirical Studies

In this section we present three empirical studies to illustrate older adults' and care professionals' perspectives towards care robots. The studies have been conducted within a project titled 'Robots and the Future of Welfare Services', a multidisciplinary research effort that examines the potential of robots to be applied within elderly care in Finland.[10]

[10] http://roseproject.aalto.fi/en/

Table 10.2 Summary of the empirical studies

Study #	Robot	Purpose of the robot	Research questions	Method	Participants
1	Care robots in general: Physically assistive robots, telepresence robots and social robots		Expectations, assumptions and arguments about robotic care	Citizen panel with lectures and group discussions (three rounds)	Older adults (65+)
2	'Double', a mobile, remote-controlled telepresence robot with two-way video connection	Provides an easy and flexible method for social connections between family members and an elderly person in nursing care	Expectations and experiences of using a telepresence robot	Case study: Three 6–12-week field studies with the robot in two nursing-care facilities, observations, interviews and focus-group interviews	Elderly residents, family members and care personnel
3	'Zora', a small humanoid robot for elderly care, based on the NAO platform	Provides rehabilitation and recreation for the elderly through human-like interaction, speaking, dancing, etc. in nursing care	Expectations and experiences of using a social robot in an organizational setting	Case study: Observations, interviews, focus-group interviews during the robot-adoption process (10 weeks) at several nursing-care facilities	Elderly residents in nursing care; care personnel

The first study is a citizen panel in which people 65+ years old gathered three times to discuss various care robots, social robots included. This data was used to provide insights into older adults' perspectives on robotic care and their arguments about the acceptability and ethics of care robots as part of their possible future lives and care. The second and third studies are case studies of a telepresence robot and a social robot (respectively) in nursing care. The focus of the second study is on the expectations and actual experiences of three elderly residents in care facilities, their family members and the facility's care workers regarding the use of a telepresence robot for social connections between the resident and family members. The third study examines the use of a social robot for recreational purposes within two care homes and a hospital; the perspectives of elderly people and care workers are included. The studies are summarized in Table 10.2.

The studies and their methods were chosen so that the actual end-users (the elderly and care professionals) could have an informed and in-context say about care robots. 'Informed' means that in all three studies, the participants were provided with information and first-hand experience with a real and current off-the-shelf robot. During the panel discussion, the researchers also gave the participants presentations about various kinds of care robots, their technical state of the art and the purposes for which they were developed; the panellists were able to ask questions and discuss the issue with the researchers. The citizen-panel method itself includes

a focus both on the participants' opinions and claims about robots and the arguments and reasoning that underlie their opinions. Each study was also implemented in an environment that was intended to be familiar to the participants: the citizen panel was held in a 'house for companionship', an open-meeting venue in a home-like building, while the case studies were arranged in nursing-care homes, where the participating care professionals and elderly residents used robots as part of their daily work and lives.

These approaches should ensure that we were able to collect rich, valid data from the actual end-users in the form of both verbal information and observations of actual use (in the case studies). Previous researchers (e.g. McLafferty 2004) have emphasized a familiar setting with a relaxed atmosphere that facilitates trust as being crucial for ensuring all focus-group members' participation. For the care professionals, participating in the study in the workplace may be the only opportunity due to their busy schedules and inability to leave their clients.

These studies together provide a multi-perspective view of the issues and influences involved in the use of care robots (social robots in particular) in elderly care. The case descriptions also illustrate the state of the art of actual current care robots and provide a window into several aspects of Finnish care and its robotization during the mid- to late 2010s.

10.2.1 Citizen Panel with Older Adults

A citizen panel was arranged to investigate, analyze and debate older adults' assumptions, expectations and arguments about using care robots and to together identify and elaborate on framework conditions that are critical when planning for the integration of care robots into the Finnish elderly-care service system. The panel was a joint effort of the VTT Technical Research Centre of Finland Ltd., the University of Tampere, and the Finnish Institute of Bioethics. A Finnish-language report of the panel and its results is available as an online document (Saxén 2017).

10.2.1.1 Method and Participants

According to Rowe and Frewer (2005), a citizen panel is a method for public consultation that is initiated by the 'sponsors' – in our case the researchers – where information is conveyed from members of the public to the researchers. The method is characterized by the selection of representative participants who meet several times to debate certain topics in a facilitated group setting. At the end of the meetings, the arguments and discussion are aggregated in a structured manner, for instance, by using a secret ballot or other types of voting. In our case, the citizen panel was particularly an effort to apply 'deliberation' to gather knowledge about older adults' views. Burgess (2014, p. 49) defines deliberation as 'a process of respectfully understanding different perspectives and technical issues, including

uncertainty, while working toward convergence or consensus'. The method allows participants to express their opinions and to hear about others' opinions; they are allowed to ponder, challenge and justify their opinions together in order to construct a shared view about the topic of discussion.

The citizen panel was arranged during January and February 2017 in the city of Tampere in southern Finland. The panel consisted of three 3-hour sessions separated by 7–10 days. We invited older adults (people over 65 years old) to participate as panellists by open calls via paper posters on local public announcement boards (e.g. in libraries and grocery stores), in a local newspaper, via invitation letters on email lists of local elderly people's associations, and in social media and radio. We enrolled 25 participants (in order of enrolment) for the first panel session; although a few people left the panel after the first session, more than 20 panellists from the same pool of 25 people attended each time.

The three sessions were led and facilitated by eight researchers. Each session had a specific topic to be debated and analyzed together: either assistive-care robots, telepresence robots or social robots. The discussion of the topic was preceded by an introductory presentation of 20–30 min about the specific type of care robots; the social robot was also demonstrated as a real 'Zora' robot (a NAO robot with special software for elderly care; see Fig. 10.2). After the presentation, the elderly participants were divided into three groups, which remained the same throughout the panel. The discussion was facilitated by one researcher; another took notes and had an assistive role. The participants were encouraged to freely express their opinions about the topic, but they were also asked to justify and argue about their claims. At the end of each session, the groups were gathered together to share and discuss the summaries of each group debate.

At the end of the final session, all opinions and perspectives the participants had raised were investigated together in a facilitated discussion. The purpose of this discussion was to identify the most critical claims and arguments, to understand

Fig. 10.2 Panellists becoming familiar with social robots. (Photo: Katariina Tuominen)

whether these claims and arguments were generally accepted (or if participants had expressed conflicting views) and to aggregate this information into a public statement.[11] The researchers later finalized the draft document.

10.2.1.2 Results

The panellists were the most positive about assistive-care robots that would help the elderly and caregivers with physical tasks. For instance, they accepted the use of such robots for transferring a person between bed and a wheelchair or to other places. They also accepted different logistic and routine delivery tasks (e.g. of medicine, linen, laundry and waste). They felt that robots should do assistive and secondary care tasks, which would allow human caregivers to concentrate on social, emotional and communicative aspects of care; they also felt that robots could not replace humans in terms of presence, interaction and touch. The panellists saw robots replacing humans in care as a potential risk.

The panellists also perceived telepresence robots as being generally positive in providing health services to the elderly as well as in supporting social connections between people who live alone and their family members. Compared to nonmobile video connections (e.g. Skype via a computer), telepresence robots provide more possibilities for family members to remotely control the robot by moving around the apartment to check that it is clean or to find a fallen older person on the floor. On the negative side, the panellists viewed the use of telepresence robots as potentially leading to decreased physical visits to the elderly; the robot might also cause fear in those who suffer from memory problems.

Social robots were the most controversial topic in the discussions. In particular, three different views could be extracted. The participants viewed social robots as (1) a positive, useful way to provide warm companionship and emotional experiences to older people; (2) liable of providing deceptive relationships built on emotions that are not genuine; or (3) a practical means to provide light chatting companionship and to help in the household. In any case, the emphasis was on autonomy and letting people decide for themselves whether they wanted to adopt a social robot. If someone is emotionally attached to a robot, the participants felt that it should not be taken away then. Using social robots with people who have lower cognitive ability (e.g. due to a memory-related illness) was a major concern; one proposed solution was to let the decision be made by family members and professionals. A clear conclusion was that social interaction and humanity cannot be replaced by interactions with a machine.

The collective outcome of the citizen panel (i.e. the public-statement document) aggregates the debates of the panel and summarizes them as five values that were of importance to the participants' consideration of the wide-scale adoption of care robots in society (Table 10.3). The most acceptable values appear to have been such robot-based care services that were in line with older people's desire to continue

[11] The public statement (in Finnish): http://www.bioetiikka.fi/?page_id=1054

Table 10.3 The central values of integrating care robots within elderly care raised by the citizen panel

Value/boundary condition	Description
Autonomy and control	Importance of supporting the autonomy of the elderly and control over the robot, as well as their autonomy in allowing robots to be used in personal care
Knowledge and education	Desire for more knowledge and education about care robots for both the elderly and caregivers
Ethics and accountability	Importance and transparency of safety issues, ethics and legal accountability regarding care robots
Justice and equality	Emphasis on justice and equality in providing care services to people, even when robots are part of the service
Human care	The priority of humans in care, particularly for social and emotional needs

their lives as independent and autonomous individuals despite ageing and related deterioration and those services that supported their social (human) relationships. Mere robotic technology is not enough; people also need to be provided with knowledge and education about the robots and their use. Safety, standards, regulation, ethics and legal issues need to be developed in parallel with the integration of robots in care; the resulting service system should be experienced as justified and equal to all.

In order to put the results of the panel in context, we will now return to the method and the participants in particular. We used several channels to reach people, but we still had to compromise in our selection of participants; we were able to take everyone who volunteered to be a panellist. Although the panellists expressed a variety of views about robots, we have to question how well the participants actually represent older adults in Finland or even in the city in which the panel was arranged. Sparrow and Sparrow (2006) suggest that if deliberative polls were given to statistically representative samples of communities on the use of robots in elderly care, the respondents would reject most of the uses. While this may or may not be true, we can nevertheless conclude that some older people feel positively about robots, and some of them feel positively even about using robots for social and emotional purposes. We hope that the values highlighted in the statement, such as autonomy in decision-making, knowledge and the priority of human care, will feed further discussions and decisions about how and for what uses robots should be applied in the future, especially concerning elderly care.

10.2.2 Case Study 1: Telepresence Robot in Residential Care

Telepresence robots are mobile, remote-controlled robotic devices that enable people to be virtually present and to interact and thus socially participate from a remote location where the robot itself is placed. While the real-time video connection

Fig. 10.3 A Double telepresence robot, driven by the daughter of an elderly resident. (Photo: Minna Kulju)

through the robot's screen is a central functionality to enable the feeling of telepresence, the added value of telepresence robots is the remote user's ability to control the movements of the robot within its local physical spaces (Kristoffersson et al. 2013). In the healthcare context, remote users' enhanced control of their telepresence enables such services as televisits by medical professionals in hospitals and care facilities. In elderly-care facilities, telepresence robots are also a potential technology for non-medical usage, namely, to facilitate social connections between residents and their family members and to support the participation of bedridden residents in social activities within the building or even outside. Few studies of telepresence robots in residential care have been conducted to date (Niemelä et al. 2017b).

In our study, we used a telepresence robot called 'Double' by Double Robotics,[12] as shown in Fig. 10.3. The robot consists of a two-wheeled mobile platform and a tablet computer with a wireless internet connection on top. The tablet enables a video connection with a camera, a microphone and speakers. The movements of the robot (including adjusting the tablet's height and the video connection and volume) are totally controllable by a remote user by using a computer's internet browser. Although Double's tablet cannot be bent to look up or down, it does have another camera for the floor view in order to help remote drivers to have a better view of what is in front of the robot at the ground level.

10.2.2.1 Method and Participants

We arranged three 6–12-week field trials in total to explore the use of telepresence robots in residential care. In these trials, we installed the telepresence robot in a room of a long-term care-home resident for communicating with her or his family

[12] https://www.doublerobotics.com/

members. Three elderly residents participated in the trials in two facilities (24-h-service care homes). In each trial, the data was collected in several ways: as pre- and post-interviews of the residents, their family members and the personal nurses of the residents and as user observations and by keeping logs of the use of the robot during the trials. In Trial 1, we also videotaped three call sessions (1–10 min) of one daughter through the robot. The care personnel participated in focus-group interviews after the trials: three care workers at the first facility and five care workers and the manager at the second facility. The results of these trials have been discussed elsewhere in more detail (Trial 1: Niemelä et al. 2017b; all three trials: Niemelä et al. submitted).

10.2.2.2 Results

The interviews with the elderly users, their family members and the care personnel all showed that the telepresence robot was found to be useful in increasing the presence of the family members towards the elderly residents and vice versa. The feeling of presence between the elderly person and the family member was felt to be stronger than on the phone, mainly due to the two-way video connection. According to both family members and the elderly persons, the contents of communication did not change due to the use of the robot.

The most interesting and 'robotic' issue in a telepresence robot is the remote user's ability to control the robot and move it around in its environment. In a care facility, a family member could use the robot to 'walk' with the resident to the facility's common spaces and, for instance, follow and even participate in a recreation session with the resident. In this study, several remote-driving sessions, also in common spaces, were arranged; these sessions were controlled by the researchers in order to ensure the safety and privacy of other people in the facility.

Neither the residents nor the family members saw much of a need for remote driving in common spaces; they spontaneously used the remote control mainly to turn the robot in an optimal direction and to adjust the height of the screen and camera. The care workers, however, perceived that the central function of the robot was to enable family members to be more engaged in the daily life and activities of the facility. The remote-driving ability would support such engagement. Importantly, they also identified several issues that need to be solved before the robot could be taken up for such a use: the robot's operators should be concerned about how other residents would react to a robot wandering the facility; the remote driver could see situations with other residents that might be embarrassing or private in nature and could possibly record them; and the remote driver could hear care workers' conversations about other residents. In particular, the privacy of other residents was the main concern to prevent the full use of telepresence robots for engaging family members in facility life.

The care workers felt positively about the robot in general; the personal nurses did not feel that they had to do extra work because of the robot (although it was their task to help the resident with the robot, for instance, when adjusting the volume or charging the robot). They provided several ideas of how the robot could be utilized more

Fig. 10.4 Zora, the social robot for care and recreation. (Photo: Satu Pekkarinen)

in the facility: bedridden residents would be able to enjoy social events in the facility through the robot, for example, which could be remote-driven by a care worker, or volunteers or even therapy workers could contact residents by using the robot.

Telepresence robots appear to be a rather mature technology to be taken into use in care facilities in order to reduce the feelings of loneliness and isolation that residents in assisted living often confront. Telepresence robots could potentially help, through increased control over a remote user's virtual presence and mobility, to engage family members more in the general life of the care facility. But other residents' privacy was the main concern that should be addressed before such robots could be deployed in a facility.

10.2.3 Case Study 2: Social Robot in Nursing Care

'Zora'[13] is a 57-cm-tall humanoid robot (Fig. 10.4). It is based on Softbank Robotics' NAO robot platform,[14] which was adapted for use in rehabilitation and recreation. Zora is steered with a tablet or other computer and has sensors, a speech synthesizer, a microphone, a camera and speakers. The robot has human-like characteristics: it walks, moves its hands while speaking and blinks its eyes. It is preprogrammed to perform several functions; no technical programming skills are required for operation.

[13] http://zorarobotics.be/index.php/en/zorabot-zora

[14] https://www.softbankrobotics.com/emea/en/nao

10.2.3.1 Method and Participants

Zora was introduced to elderly-care services in the city of Lahti in southern Finland in early 2016. The pilot test period lasted for 10 weeks, from December 2015 through April 2016, when the robot was introduced for the first time in elderly-care environments. This adoption process was observed by three researchers from LUT University, Lahti campus (see also Chap. 14). The use of the robot has continued since that time.

The researchers collected the following data for this purpose at two 24-h-service care homes and at a geriatric rehabilitation hospital: (1) ethnographic observations of the robot being used for rehabilitation purposes, (2) focus-group interviews with the care personnel and (3) a group interview with five customers. A total of 40 people were interviewed. The 35 care worker interviewees were mainly nurses or assistant nurses. The ethnographic observations consisted of 27 sessions, of about 1 h each, in which the robot was either introduced to the customers in a special session or acted as part of regular group activities (exercise, music or other recreation groups) at the care homes or the hospital. The robot was first used for 2 weeks in the first care home and 4 weeks in the second. At the hospital, it was first used for a month. In addition to activity sessions, the robot was used individually with a few bedridden patients.[15] Lahti city officials renamed the robot 'Ilona' (a Finnish name containing the word 'joy') to make the robot easier to approach and talk about.

10.2.3.2 Results

The experiences showed that robot usage, as a form of digital service and as a physical assistant, requires various kinds of resources from the care organization and its personnel, including knowledge and skills, time allocation and organizational infrastructure. The care professionals highlighted the importance of knowing customers and their needs well in advance when planning to use the robot. They mentioned that ample time for training and orientation for all personnel was needed (Pekkarinen and Hennala 2016). Turja et al. (2018) recently underlined the importance of developing proactive workplace practices where different-level employees can collaboratively plan the possible implementations of care robotics. Those who operated the robot considered it rather easy to operate, but two care workers are needed in use situations: one concentrates on robot operation, while the other focusses on the customers. Several challenges for workers' busy care schedules arose. The robot also requires an internet connection and a depository where it is easily accessible.

As a physical assistant, the participants viewed the robot as a cute and sympathetic persona, although the small size also caused problems for elderly people with poor eyesight or when the robot was used amid a large group of people. Likewise, the robot's speaking voice was too quiet for those with hearing problems, and lip-

[15] Part of these results have been discussed in previous studies (Pekkarinen and Hennala 2016; Melkas et al. 2016; Tuisku et al. 2018; Melkas et al. submitted).

reading was not possible, both of which caused some confusion among the customers. Special context sensitivity is thus required of the staff when working with the robot to ensure that customers will know what is happening, especially when technical problems occur or other confusing situations arise (Pekkarinen and Hennala 2016). The customers at the care units needed quite a bit of assistance, and many had memory-impairing conditions. Considering these circumstances, they welcomed the robot surprisingly well. Our findings that residents had a more positive attitude towards robots than the care personnel did are also in line with other studies, such as Broadbent et al.'s work (2012).

The customers and care professionals generated several ideas about future opportunities in which the robot could be used (Melkas et al. submitted). The ideas represented various possibilities ranging from physical assistants to digital services; quite a few of the ideas contained elements from both. The robot could help demonstrate everyday routines, such as how to eat or brush one's teeth; it could also pick up trash from the facilities. The care professionals stated that with a robot, it was possible to simultaneously improve customers' functional capabilities from many perspectives: physical, cognitive and social. While performing dances or playing interactive games, the robot stimulated the customers into movement when it was waving its hands. The robot also elicited reminiscences, memories and social interaction. More multi-faceted functions could be found for this kind of use and for working with emotions and gestures in smaller groups. Another suggestion was that the robot could reduce loneliness in bedridden customers and calm restless customers by reading aloud from books and daily news items, especially during busy hours. Others highlighted that the robot could act as an interpreter in those circumstances where the care worker and the customer do not speak the same language (see also Turja et al. 2018). These ideas largely corresponded to the applications that Dahl and Kamel Boulos (2014) discussed in their study. The professionals quickly contributed their own ideas about the appropriate tailoring of robot usage in their particular environments. Many customers also wanted to express their ideas. Having opportunities to gain one's own experiences (as discussed by Savela et al. 2018) and valuing new ideas concerning robots' tasks appear to be important in building up the basis for meaningful future use, perhaps even including a sense of commitment towards robots (Michael and Salice 2017).

The participants mentioned many negative impacts and challenges as well, some of which depend on whether the 'novelty' fits in with one's work as a motivating issue, an extra burden or a cause of anxiety. The robot caused extra work during the implementation phase. The professionals noted tensions and questions about the essence of care work between robot-users and non-users. Some of the customers disliked the robot. Based on the results, the roles of the robot were particularly related to new and multi-faceted ways to maintain and promote elderly people's functional capabilities. The robot created various kinds of interaction (Wada and Shibata 2007) among customers, as well as between customers and care personnel. It did not especially help the care personnel during busy hours, as the challenges related to learning and time use were too great.

10.3 Discussion

The three empirical studies described in this chapter highlight how older adults and care professionals perceive care robots and their usage in care. In particular, the two empirical case studies demonstrated current off-the-shelf robots and their effects on social relationships and practices in care. As we have seen, although the robots are rather simple, one-purpose devices with very limited interaction capabilities, they provide the means to observe people's reactions and behaviour with robots during real-use situations and environments. This observation has allowed us to build a deeper understanding of people's expectations of and refusals to use robots in care. For instance, care facilities might well be interested in and ready to adopt telepresence robots for different usages in order to improve their services for the residents and their family members, but first the privacy of the residents should be ensured.

Even though the three studies were quite different (and the summarizing of case studies may not be necessary; Flyvbjerg 2006), they did indeed yield certain similar findings. Table 10.4 shows the values and expectations identified in the citizen panel connected to the experiences across the two implementation cases. The findings are in line with previous studies (e.g. on care professionals; Turja et al. 2018), but their combination increases our as-yet meagre understanding of the experiences of using robots in real-life settings and the expectations of present and potential users. Flyvbjerg (2006) has advocated case studies as a means of providing concrete, context-dependent knowledge; according to Flyvbjerg, formal, non-generalizable knowledge – such as that produced by case studies – can still contribute to the cumulative development of knowledge in a given field or society. In the case of robotics in elderly care, this is essential in our view, as the elderly-care field, robotic technologies and the societal structures found in elderly care are all transforming. Those changes – which in the case of technologies are very rapid – can be 'caught' with the help of case studies.

Although we have described care robots in this chapter as physical devices, they can be thought of as a part of the trend of digitalization of services and whole societies. 'Digitalization' itself has become somewhat of a buzzword today, as it is often used without specifying what it actually means. Still, digitalization is evident around us at many levels. For instance, older users are provided with digital self-care or recreation applications,[16] care organizations have adopted computer-based care resource management and mobile work and access-control systems, and in Finland, a nationwide effort is underway to collect citizens' health data and to provide certain health services such as medical e-prescriptions in one central information system, called Kanta (the National Archive of Health Information[17]). Computing-enabled, digitally controlled physical care robot devices may be thought of as one step of digitalization in

[16] As an example, a digital online reminiscence service has been developed for elderly individuals or groups; see Niemelä et al. (2017).

[17] https://thl.fi/en/web/information-management-in-social-welfare-and-health-care

Table 10.4 Summary of the findings according to the central values raised by the citizen panel (the main experiences in care facilities appear in *italics*)

Value/boundary condition	Description of the citizen panel's expectations	Experiences in care facilities
Autonomy and control	Importance of supporting autonomy of the elderly and control over the robot, as well as their autonomy in allowing robots to be used in their personal care	Autonomy through supporting social connections and providing 'light' companionship – To reduce loneliness and isolation, for example
		Autonomy through improving functional capabilities (Zora)
		Autonomy changes in a care-facility setting; this value was thus brought up more indirectly
Knowledge and education	*Desire for more knowledge and education about care robots for both the elderly and caregivers*	*Technology itself is not enough, but there is a need for new knowledge and training in robots and their use*
		Gaining one's own experiences also enables ideation about where and how robots could be used in the future
Ethics and accountability	*Importance and transparency of safety issues, ethics and legal accountability regarding care robots*	*Careful planning, including ethical issues, is needed when taking robots into use*
		Robot use should not lead to decreased physical visits by family members or deception (Zora) or breaches of privacy (Double)
Justice and equality	Emphasis on justice and equality in providing care services to people, also when robots are part of the service	Less emphasized in care facilities
		As with autonomy, the view of justice and equality is likely to change in a care-facility setting
Human care	*The priority of humans in care, particularly for social and emotional needs*	*Care robots were viewed relatively positively when used in well-specified tasks, such as secondary care tasks*
		Human caregivers are crucial for social, emotional and communicative aspects of care, and robots should not replace them

elderly care, where physical assistance is a necessity that cannot be provided by mere digital solutions or information systems.

Compared to other dimensions of digitalization, however, care robots may be subject to extra attention because of their concrete presence and operation in the same physical spaces in which people live and work and because of their attempts to communicate with people. This situation seems to be particularly true with social robots, which are designed to provide human-like, natural interactions, feelings of social presence and even emotional bonding for human users. According to Frennert et al. (2017), the consequences of increased digitalization in society are that human experiences are progressively mediated by technology. Digitalization changes

human communication, actions and practices, and social robots may further intensify these changes. According to the empirical studies presented in this chapter, older adults and care professionals found several acceptable and desired uses for care robots in elderly care, but they also presented requirements and framework conditions. In particular, the participants in both case studies and the citizen panel highlighted the priority of humans in care, while the participants found robots to be acceptable for carrying out secondary care tasks.

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Chapter 11
Innovation by Experimenting in Public Services

Johanna Leväsluoto, Kirsi Hyytinen, and Marja Toivonen

Abstract Experimental development has been suggested to answer the problems of slowness and ineffectiveness in current innovation activities. It is also applied in the public sector, where it raises specific issues due to traditional bureaucracy and strong professionalism. In our study, carried out via interviews, we examined experimental development and its challenges in a middle-sized Finnish city. The experiment focused on a new integrated model of wellbeing that aimed to promote multi-professional collaboration and citizen empowerment in child and family services. A common service plan and a digital platform were core elements in the model. However, the purpose of the experiment remained too vague to the practitioners, and the experiment was stopped before the deadline. Central challenges were the one-sided focus on top-down management, growing workload and problems of the digital platform. Despite the 'failure', the experiment offered valuable learnings that can be applied in the future. Clarifying the concept of experimenting and improving the collaboration between local activities and governmental policies are among the most important lessons learned.

Keywords Experimental development · Public sector innovation · Wellbeing services · Social services · Digitalization

J. Leväsluoto (✉) · K. Hyytinen
VTT Technical Research Centre of Finland, Espoo, Finland
e-mail: johanna.levasluoto@vtt.fi; kirsi.hyytinen@vtt.fi

M. Toivonen
University of Helsinki, Helsinki, Finland
e-mail: marja.toivonen-noro@helsinki.fi

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11.1 Introduction

This chapter discusses experimental development in the public sector. It focuses on a case study and, as a background for it, analyses literature on the benefits of experiment-based innovations and on the specific innovation challenges in the public context. The concept of 'experiment' refers to so-called social experiments, in which a pilot test in a real-life context is set up to obtain empirical evidence of the effects of a policy programme or some other novel societal solutions. The rationale is to observe whether the programme works in action and to create a working model that takes into account the success factors and sources of problems in the programme (Orr 1999).

Experimental approaches have been suggested as a more successful innovation model than the traditional linear model, which is based on a highly formalized process. Slowness, rigidity and insufficient effectiveness of the linear model have encouraged search for alternative ways to carry out innovation activities. The proponents of experimentation have argued that this approach suits particularly well to the conditions of modern society. It merges planning and implementation and in this way favours flexibility which is necessary in answering the challenges of continuous and rapid changes, typical of the current development (Eisenhardt and Tabrizi 1995). Experimentation also provides means for rapid learning. Several innovation theorists have highlighted that practical forms of learning are particularly important in innovation; they include learning by doing, learning by using and learning by interacting (Lundvall 2001). Further, experimental approaches are compatible with the ideas of open innovation, which is one of the cornerstones of the modern views on innovation (Chesbrough 2011).

Experimental development has gained foothold in the public sector, too. There are, however, specific issues in this context that generate challenges to the adoption of experimental practices. First, the concept of innovation is a newcomer in the public sector (Windrum 2008); the changes have usually been understood as 'reforms' or 'policy changes' (Christensen 2012). Second, the inclusion of bottom-up initiatives is often missing as the top-down perspective has traditionally dominated the activities of public administration (Hartley 2005). Third, the dissemination of the results of experiments is challenging, because experiments are often launched without an allocation of the responsibility and resources for the spread of the results. General models that would facilitate broader applications are rare (Tummers et al. 2009).

In our study, we examined the manifestation of these challenges in a case in Finland. In 2014, the Finnish Parliament accepted a law on experiment-based development in cities and municipalities for the years 2015–2016. The aims were to promote experimental culture in Finnish municipalities, on the one hand, and to generate more efficient and effective services, on the other. We have studied the implementation of experimental development in a middle-sized Finnish city, in particular, but also interviewed ministerial representatives about the general goals and nationwide achievements. The specific experiment that we focused on at the local level concerned the introduction of a new integrated model of wellbeing in social

services for children and families. The key elements of the model were multi-professional collaboration, a service plan jointly formulated by the customer and the professional and a digital platform that would support the dialogue between the professionals and the customers. The purpose of the experiment was to promote multi-professional teamwork and citizen empowerment.

After this introduction, we have structured the chapter as follows. In the second section, we present the theoretical backgrounds of our study: the development from linear innovation models towards more experimental approaches and specific issues characterizing innovation in the public sector. In the third section, we describe the context of our empirical study and the methods of data collection and analysis. The fourth section summarizes the results. We have divided the results to those describing the views of the representatives of the local level (our case city) and to those describing the nationwide perspective of ministerial representatives. In addition, we report lessons learned from the experiment. The fifth and last section includes the concluding discussion.

11.2 Theoretical Background

11.2.1 From Linear to Experimental Innovation Models

Models based on intra-organizational research and development (R&D) have dominated the discussion about the innovation process. The ideal has been a sequence of stages: idea generation, screening, evaluation, detailed development, testing and launch. The concept and practical realization of these stage models have been crystallized by the representatives of the 'schools' of NPD (new product development) and NSD (new service development) (e.g. Cooper and de Brentani 1991).

The focus of the stage models has been the systematization of development processes, resulting in the increase of visibility of innovation efforts (Toivonen 2010). The visibility has facilitated the creation of innovation indicators based on the resources allocated. Indicators are used at both the organizational and the policy level. In the latter context, a benefit has been the possibility to adopt tools for innovation support and to measure its amount. On the other hand, stage models are time-taking – a problem that was identified soon after their introduction. This problem was answered by a modification that is today generally applied: a parallel conduct of stages (Alam and Perry 2002).

However, there is an additional problem: in practice, the stage from which the innovation process begins varies, and the end of one innovation process is often the beginning of the next. Several researchers have suggested that models of a spiral or circular type correspond better to the complex and recursive nature of innovation than a linear logic (Buijs 2003). In order to make the stage model to answer better the reality, there has emerged a suggestion that the front end of innovation should be separated from the later stages. It has been argued that experimental activity, which

includes side steps and iterations, particularly characterizes the beginning of an innovation process. Through the separation of the front end, a synthesis has been pursued between creative problem-solving and rational planning (Koen et al. 2001).

Even this solution does not answer the basic challenge: the nature of innovation as a phenomenon whose result is not known beforehand. Engvall et al. (2001) point out that stage models have concentrated on the systematization of the form of the innovation process but say very little about the content. However, it is just the content which is the main problem: the idea included is still immature and difficult to express in words. Constructing a plan for something which is not well-known and involves abundantly tacit knowledge is not a reasonable approach. More effective is a strategy which enables the creation of shared experience of the object to be developed. This means that planning and implementation should be merged to some extent.

Also other researchers have questioned the idea that planning always occurs first and is followed by implementation. Moorman and Miner (1998) argue that 'organizational improvisation' is general in practice but often hidden behind a formal description of innovation processes. They identify three circumstances in which this approach is particularly important. First, unexpected stimuli may create the need for action without providing time for planning. Second, this approach might be prompted when planning cannot provide all the details needed in implementation. Third, a situation where much real-time information is available evokes immediate responses. Similarly, Eisenhardt and Tabrizi (1995) suggest experimental innovation with reliance on real-time experience: rapidly building intuition and flexibility is essential on the uncertain path of innovation.

The development of user-based innovation has progressed hand in hand with the non-linear thinking about innovation (Sundbo and Toivonen 2011). Traditionally, users have been considered important as the source of needs-based information, and still today many organizations interpret user orientation as the gathering and storing of user information. This approach has, however, been criticized as 'superficial', and the elaboration of user information into deeper user understanding has been required. This means that information should be structured, interpreted and shared to make it applicable and to link it to the organizational strategy (Nordlund 2009). The actual involvement of users is also an emerging trend. In addition to the emphasis on user interaction in the front end, the role of users has been highlighted in the transition from development to implementation (Hasu 2001).

The possibility of interactive learning highlights the users' role in innovation. The creation of shared experience of the object to be developed requires that both the users and the providers are understood to be innovators. von Hippel's work (e.g. 1978, 1986) during three decades has paved the way for this view. According to him, users offer more than an idea for a new product or service. They may provide an innovating organization with the identification of a problem or need, outcome-related specifications or even a complete design of a product or service. In newer research, the continuation of the innovation process after the launch has been pointed out. Because novelties have different meanings for different user groups, they are often reinvented: actively interpreted and appropriated by users. Sundbo (2008) calls this phenomenon 'after-innovation'. He states that an innovation is not

completed when it is launched, because customers cannot say beforehand what they want. They suggest ideas for improvements when they use the novelty in practice.

Along with the interest in user-based innovation, a question has been raised about the ways in which user experience could be made continuously flowing into the provider organization. The approach of employee-driven innovation highlights that front-line service workers have understanding on user needs based on the daily interaction. They can transmit real-life information and combine this information with their own ideas. However, the implementation of these ideas requires that the bottom-up processes are recognized and organized by the management. Managers should support employees by allocating resources, and they may also invite employees to participate in top-down innovation processes (Kesting and Ulhøi 2010).

One interesting employee-driven phenomenon is 'bricolage' (Fuglsang 2010). Theorization on employees as bricoleurs analyses their role not only in the transmitting of ideas but also in their implementation. Bricolage includes a process of co-shaping an emerging path: various actors offer inputs and gradually build competences via learning by doing and interacting. The boundaries blur between design and implementation and between rule making and rule following. The bricolage view suggests that in a situation characterized by resource constraints, employees may find innovative solutions based on 'whatever is at hand'. This notion is particularly important in public services which are often developed in the conditions of scarce – even diminishing – resources.

The approach of effectuation (Sarasvathy and Kotha 2001; Sarasvathy 2008) is near to the ideas of bricolage. Effectuation has its background in theories that highlight the significance of human resources, relationships, networks and institutions. It suggests the replacement of predictive logic with a means-oriented approach to tackle the uncertain environment and to co-construct novel solutions with stakeholders. The means-oriented approach begins from available resources that are expanded in the courses of action and enable a stepwise clarification of goals. This approach clearly differs from a linear process, which starts from the identification of an initial opportunity, sets a goal and aims to achieve it in a preselected context (Read et al. 2009).

Adaptive trial and error characterize effectuation and are necessitated by the uncertainties of the current operational environment. In such a situation, predictive information does not support decision-making in the best possible way; more reasonable is relying on strategies that enable direct control, co-creation and transformation of conditions towards positive outcomes. Quickly realized small successes and small failures help avoid the risk that some action would put the entire effort in jeopardy (Sarasvathy and Kotha 2001). However, this alternative approach must include enough structure to support the utilization of resources and to foster collaborative creativity. It can be achieved via framing the problem comprehensively: using a framework or schema within which specific decisions and their linkages to other decisions can be contextualized. The ability to group problems into fundamental categories and relate them to other problems results in knowledge architectures that link multiple decisions in the task domain over time with feedback and interpretation (Read et al. 2009).

11.2.2 Innovation in the Public Sector

Public services face today the combined challenge of increasingly wicked problems and scanty financial resources. There is an ongoing change in the intervention strategies of public management which reconstructs its responses to economic and social crises, weakened social links and the challenges of welfare state (Harrisson et al. 2010). In addition to incremental improvements that continuously emerge in public organizations, also systemic changes characterize the public sector. However, as mentioned in the introduction, the concept of innovation has only recently been introduced to the conceptual apparatus of public management (Windrum 2008).

Researchers have also identified a larger, paradigmatic change in the way in which the nature of the public sector and public services has been understood. This change has taken place during the last 30–40 years and includes the transfer from the traditional public administration to new public management (NPM) and further to the emerging network governance (NG) (Langergaard 2011). The traditional administrative paradigm held a top-down view of the public sector, which was seen to be based on a bureaucratic and rule-based order. Services were authoritative pursuing equity but not providing users with a possibility to influence (Torfing and Triantafillou 2013). Changes were initiated top-down via legislation (Hartley 2005). The traditional paradigm held its dominance until the 1980s when the NPM paradigm was introduced. It brought market mechanisms to the public context: business-type management, lean processes, performance focus and contracting-out. One of the most important ideas was handling the citizens as customers who have the right to require high service quality and free choice (Rhodes 1996). NPM also meant that innovation was explicitly articulated as a goal (Langergaard 2011).

The benefits of NPM are indisputable compared to the earlier bureaucratic view. On the other hand, also its limits have become apparent along with the development towards increasingly complex issues, multiple actors and need for open dialogue (Sørensen 2002). Consequently, while NPM still has a strong position in the public sector, there is a new paradigm emerging: the so-called network governance (NG). It highlights relationships and partnerships and co-production as the service model (Newman and Clarke 2009). Efficient intra-organizational processes are no more enough, but the crucial issue is the empowerment of citizens. The emphasis on governance over government favours horizontally organized and relatively fragmented systems in which order is achieved through the regulation of self-regulating networks.

Currently, the NG paradigm evolves in parallel with market imitation and the still surviving elements of bureaucracy (Newman and Clarke 2009). The co-existence of these fundamentally different views is not without contradictions. A central problem is the reconciliation of the top-down thinking, which is a typical element in traditional administration, and the bottom-up views, which belong to the principles of NPM and NG. Contradictions between the top-down and bottom-up approaches are visible at both the organizational level and the policy level.

Strong professional power is a characteristic of public services (Currie et al. 2012). Traditionally, this power was built on 'occupational professionalism', i.e. on a specific discipline and expertise (medical, educational etc.). It emphasized autonomy and self-regulation of work by professional groups, whose expertise places them in a unique position to act best in the users' interests. Both NPM and NG have aimed to change the nature of professionalism towards organizational professionalism (Evetts 2003). It is a managerialist version of professionalism and serves the interests of the organization rather than professional groups (Hood 1991). Professionals are expected to be entrepreneurial, creative and efficient lifelong learners and teamworkers, who should share and transform their knowledge and cooperate with other professions (Dent and Whitehead 2002).

In contemporary studies, there is a strand which posits the existence of a hybrid of organizational and occupational professionalism (Skelcher and Smith 2015). This hybrid perspective provides a good starting point for the consideration of the issue on how to promote innovativeness among professionals. The approach of employee-driven innovation (Høyrup 2012; Kesting and Ulhøi 2010) has highlighted that actions supporting the wellbeing of employees are relevant in terms of creating a better atmosphere for the adoption of new practices. Flexible service production models that are responsive to the changing needs of the users require a focus on supportive leadership, boosting employees' intrinsic motivation, creativity and wellbeing. They call for managers to better recognize bricolage: mundane problem-solving activities (Fuglsang and Sørensen 2011). The needs of users are embedded in the approach of employee-driven innovation but need attention in order to make the interaction with users successful.

According to the idea of network governance, citizens are active partners in planning, creating and shaping the delivery of public services (Moore and Hartley 2008). 'Citizen empowerment' has been the key concept to understand the citizen participation. WHO (1997) defines empowerment as a process through which citizens get greater control over the decisions and actions affecting their health and wellbeing. This approach views people as subjects and actors who have sufficient skills and self-efficacy to take the responsibility of their conditions in their own hands (Mäkinen 2006).

With the rise of information technology and digital applications, citizens have gained new abilities and ways to participate and express themselves in a networked society. In healthcare, for instance, citizen empowerment through digital platforms has been an active area of research and development (R&D) (Honka et al. 2011). Several studies show that the empowerment of citizens can be accelerated with digital devices and applications (Samoocha et al. 2010; Webb et al. 2010). Digital empowerment has helped to put citizens on the drivers' seat to manage their own wellbeing and lifestyles (Papastergiou 2009).

However, researchers have noted that the potential of service co-production with users and citizens has not been fully understood in the context of public services (Bovaird 2007). An additional challenge is that professionals often have difficulties to identify the policy programmes they are expected to implement (Tummers et al. 2009), which leads to the non-spread of innovations (Ferlie et al. 2005).

Understanding the collaborative processes of public service creation and delivery through digital platforms is also insufficient (Bovaird 2007). To improve the situation, the service culture should be renewed so that it enables both the actual partnership with citizens and the utilization of a variety of communication and interaction channels between citizen and professionals.

11.3 Empirical Context and Methodology

11.3.1 Context of the Study

As mentioned in the introduction, our case context is the experiment-based development in Finnish cities and municipalities in 2015–2016. A specific law accepted by the parliament formed the framework for this development. More than 30 cities and municipalities participated in the project. Six topics were selected for experimentation: educational services, housing services, youth employment, collaboration of public authorities in social security, auditing of municipal operations and an integrated model for wellbeing (Tempo Economics 2017). Our study concerned the last-mentioned topic and its implementation in a middle-sized Finnish city. We chose this experiment for our study because it represented a particularly ambitious effort to promote simultaneously employee-driven and user-based practices in innovation. The experiment also highlighted the use of digital tools in the empowerment of citizens in a new sector: social services. (Our study was part of a bigger project that focused on the development of public services in the digital era: 'The revolution of service economy - Human being at the core of digitalization'.)

The city focused its experiment on child and family services. The 'integrated model of wellbeing' included a life-cycle based total offering whose objective was to reinforce the citizens' ability to take responsibility of their own wellbeing and to support this development via multi-professional collaboration. The total offering consisted of social care (child protection and family counselling) and preventive and therapeutic services in the neighbouring sectors: day care, primary schools and healthcare. The novelties experimented were a service plan to which both the customer and the professionals commit themselves a digital platform as a mutual information and communication channel between citizens and different professionals. Empowering citizens to participate in the planning of services was also an aim.

The integrated services were especially targeted to citizens who have multiple needs for social care and who therefore are in contact with different professionals from different sectors. The focus was on preventive services in order to diminish problems whose afterward relieving requires considerable resources. Four key processes were identified: (1) early discussion about the concerns of citizens, (2) high-quality multi-professional collaboration, (3) long-term support to the parenthood and (4) the development of social skills of both parents and children. These processes were concretized into life-cycle based and integrated service products. A

common service plan aimed at collecting together the various plans that were made for the customer, each of them answering a specific need. These kinds of service plans have earlier been used in healthcare, for example (Määttä et al. 2014), and they are actively discussed in other sectors, too. The digital platform aimed to facilitate the distribution of information: the professionals and the customer had access to one and the same information. They could also update and complement the service plan that was made in the electronic form and located on the platform.

11.3.2 Data Collection and Analysis

We applied semi-structured interviews as our main source of data: the topics were decided beforehand, but within them, the respondents were given a great deal of freedom (Bryman and Bell 2011). The interviews were carried out in two rounds. In the first stage, we interviewed the managers and professionals who had participated in the experiment. In the second stage, we interviewed state representatives who had been developing the framework for the nationwide project. The first-round interviews were carried out between October 2015 and February 2016 and the second-round interviews between November 2016 and February 2017.

In the search for the interviewees, we used snowball sampling. We started the first round by interviewing the local manager of child and family services. Based on her suggestion, we thereafter invited other local interviewees: managers and professionals. The interviews of the managers were conducted individually, and the professionals were interviewed in three groups. The first group consisted of professionals from child protection and family counselling and prenatal and child health. In the second group, the professionals represented specialist day care, pre-primary education and therapeutic services (speech and activity therapies). While these two groups were specifically compiled for our interviews, the third group collaborated on a permanent basis: the professionals in this group were responsible for the evaluation of customer needs. They represented family counselling, health services in primary education and day care and team leaders of child and family services.

The results of the first-round interviews revealed the challenging nature of the experiment; it was actually closed down before the end of the nationwide project. This made us interested in studying the reactions of the upper city management and the views of the governmental representatives who had been developing the framework for the municipal experiments and the respective law. We applied again snowball sampling. We started the second round by interviewing the head of education and welfare services in the city and, based on her suggestions, requested interviews from two additional local managers who could provide strategic and customer-centric perspectives. She also gave us recommendations for interviewees at the state level: ministerial advisers who had been developing the experiment-based pilots in health and social care. Finally, we interviewed leading experts from the Office of Data Protection Ombudsman. These interviews were included because the sensitivity of the information in social services had been continuously raised as an issue in

the interviews; the Ombudsman had also been involved in the preparation of the law for municipal experiments. The summary of the interviewees is presented in Table 11.1.

The main topics of the first-round interviews were:

(1) The background of the multi-professional collaboration and its current stage in the child and family services.
(2) The role of customers in the multi-professional service interaction.
(3) The main elements of the new integrated model of wellbeing.

Table 11.1 Summary of the interviews

Interview rounds	Number of interviewees	Time
Round 1		
Local managers (total)	5	October 2015–February 2016
Manager of child and family services	1	
Manager of educational services	2	
Manager responsible for the development of the digital platform.	1	
Manager responsible for the procurement of child and family services.	1	
Local professionals (total)	18	
Group 1		
Child protection and family counselling.	1	
Prenatal and child health.	4	
Group 2		
Specialist day care	3	
Pre-primary education	1	
Therapeutic services (speech and activity therapies)	3	
Group 3		
Family counselling	3	
Health services in primary education	1	
Day care	1	
Team leaders of child and family services	1	
Round 2		
Local managers (total)	3	November 2016–February 2017
Head of education and welfare services	1	
Strategy manager	1	
Manager responsible for customer processes	1	
State representatives (total)	4	
Ministerial adviser from the Ministry of Social Affairs and Health	2	
Data protection ombudsman	1	
Lawyer from the Office of Data Protection Ombudsman	1	

(4) The aims of the new model, concerning particularly the digital service plan.
(5) The managerial challenges linked to the new service practice and to the change pursued.

In the second-round interviews, we focused especially on the following topics:

(1) The aim of the nationwide experiment as regards the topic of the integrated model for wellbeing.
(2) Implementation of the experiment; experiences of implementation.
(3) Impacts of the experiment on local and nationwide systems.
(4) Scaling up – the outcomes of the experiment.
(5) Continuation based on the results.

All interviews were recorded and transcribed. The analysis and interpretation of the data was conducted in a dialogue between theory and empirical findings. The empirical observations were analysed in the light of the theoretical bases of the study: the experimental approach in innovation and specific issues of the public sector. We did not use any computer-assisted coding tool, but several rounds of analysis were carried out to derive meanings from data and to reduce the amount of data (Huberman and Miles 1994). While reading the interviews, we uncovered the most common and typical themes and classified and structured them. In this way, we aimed at creating a holistic, systematic and thorough understanding of the research topic. The quotations in the results sections illustrate the level at which extracts were picked from the material. During the first round, the analysis results were presented to the city representatives who participated in the study; a workshop was organized to validate the results and to acquire supplementary information.

11.4 Research Results

This section presents the results of our empirical study based on the interviews. It explains first briefly how the experiment – an integrated model of wellbeing in child and family services – was implemented in our case city. Thereafter, the results are presented in two main parts: experiences at the local level and experiences at the state level. (The local interviews from the second round have been combined with those of the first round. An exception is some views of the local head of education and welfare services who also commented issues of governmental policy). In the reporting of the results, the different respondents belonging to the same profession or position have been distinguished from each other by marking them A, B, C etc.

The views of the local actors revealed two main challenges in the experiment: motivational problems among the professionals due to top-down management and growing workload and problems of the digital platform. In the views of the governmental developers, we identified two main topics: the concept and management of experimental development and the issue of data security and confidentiality. These challenges and topics have been analysed in different subchapters respectively. In

addition, there were quite lively discussions on the further development of the experimented model – we report them as lessons learned from the 'failed' experiment.

11.4.1 A Short Summary of the Conduct of the Experiment

Our case city was one of the first participants in the national project on experimental development. As many other Finnish cities, also this city had applied the idea of integrated services in healthcare, and the results had been promising. Now the managers of social services were eager to test this idea in the services of their sector. A project team was established, and the manager of child and family services was selected as the leader of project. However, she changed her job to another organization after the first project year, and because the project also otherwise was going to its end, a new project manager was not selected.

As the target sector of the development consisted of multiple different units, disseminating information about the goals of the project would have been a key task to make the participants committed. This task was not carried out properly and early enough. The project group asked superiors to tell professionals that there will be a common service plan on a digital platform, and this information was also disseminated via direct emails to professionals. The application of the plan was, however, voluntary – demands on its use were not presented, and the cases in which it would be particularly suitable were not specified in detail. Because only a few professionals had participated in the development work, a broader understanding about the purpose of the project did not develop.

A digital platform was considered essential right from the beginning of the project. In social services, the customers usually meet several professionals, but the professionals have not traditionally exchanged information about the customer needs. The only one who can combine information is the customer him-/herself, but he/she cannot evaluate the relevance of various pieces of information without professional help. Thus, the project group started to develop a common digital platform for those parts of customer data that were not too confidential for professional exchange. The design of the platform was purchased from an IT company and was tailor-made for the present purpose. However, the resources reserved for the development were minor, and the platform included many shortcomings. The work was delayed, and the deadlines were postponed many times. The users were given the possibility of comments at quite a late stage. When the platform was nearly finished, three implementation sessions were arranged to professionals on the use of the platform.

In addition to the information exchange between professionals, the digital platform was aimed at being a tool for customers and for the interaction between customers and professionals. The idea was that the customer's multi-professional service plan is saved on the platform and thereafter both professionals and customers can update it digitally. To make this idea work, the recruitment of suitable cus-

tomers was a central task but turned out to be too difficult. Marketing the service by the professionals was passive due to the above-described unclarity of the novel practice. The end result was that only a couple of customer families willing to use the platform were found. This and other problems led to closing the experiment during the second year. Even the families that preliminarily promised to use the platform did not actually use it.

11.4.2 Challenges in the Implementation of the Experiment at the Local Level

11.4.2.1 Top-Down Management and Growing Workload

The interview results revealed that the professionals participating in the experiment had positive experiences about working with other professionals and they welcomed new possibilities of multi-professional practices. They wanted to break down organizational silos and lower barriers between professionals and service users. The interviewees considered that an important positive effect of the new model and the related digital platform was the possibility to see information produced by the professionals of other sectors in common customer cases. Also the managers thought that the new model would improve customer-centricity and the digital tool would make the work of professionals easier because it facilitates the access to information. The citation below presents this view:

> Multi-professional work is an established way of working in the city. A common service plan is a good tool to make this multi-professional work easier. (Manager responsible for the procurement of child and family services)

However, the way in which the renewal was introduced caused problems. From the beginning, the experiment was led top-down. The idea of the service plan was not co-created; only a few professionals participated in its development. This weak involvement affected negatively on their commitment. Even when organized, many professionals had skipped the participation in the development sessions – tight timetables and the professional priority of the customer work were used as excuses. These problems are illustrated in the following citations:

> We got an invitation yesterday to meet next week's Tuesday. We arrange customer appointments two weeks ahead and it is very difficult to fix new times for the customers. You would need to call customers and rearrange the meetings, which might have been cancelled and rearranged many times before. Sometimes I feel that these projects force me to abandon my primary work. (Representative A of prenatal and child health)

> I have a very distant relation to this project and I do not know anything about it. I was not able to participate in the first implementation session in which the model and platform were presented. I have had a lot of work and [I have worked] also overtime hours so I have not had the time to ask my superior about this. I only received the invitation to this meeting [the study workshop] – otherwise, the project is a total mystery to me. (Representative B of prenatal and child health)

The professionals were also afraid that the experiment would generate new tasks and responsibilities that would challenge their ordinary work. The interviewees complained about 'a never-ending flow of new tasks' which decreases the face-to-face time with customers. In the long run, the increase of the workflow may cause wellbeing problems.

> The main problem is that there are always more and more responsibilities even though your workload is already full. New tasks are added on the former responsibilities. Nothing is taken away. A key question is how long you can increase the workload of professionals. Do we think that they can cope with all these new tasks? (Representative A of specialist daycare)

The experimental nature of the new model generated concerns, too. The interviewees thought that the new model may just be a pilot and will not become a part of their daily practices. Thus, they had difficulties in motivating themselves to participate actively in the development. Notably, this was not the only development project as the following quotation shows. The interviewees felt it problematic to identify which projects are genuinely impactful in practice and therefore worthy to participate.

> There are many experiments starting; in the end, they do not affect any practices. Often these initiatives even stop before they have properly started… Initiatives come and go, come and go. And when you have lot of work, you can continue without realizing the effects of these experiments. It is very difficult to know in which experiments you should take part. Quite often when I have tried to participate and wanted to find out what the idea is in an initiative, the experiment has already disappeared. (Representative A of pre-primary education)

Not only professionals but also managers presented critics against the poor implementation of the project. The manager responsible for customer processes noted that – in addition to the top-down nature of the process – a problem was that no one genuinely took a responsibility of the actual development work. Various managers and professionals were involved in it, but the work was not coordinated and resourced properly. That caused concurrent and divergent processes, in which the professionals did not share the same understanding and targets of the development.

> To really promote project targets, someone should concentrate on this work. We need someone to coordinate and take the overall responsibility … Otherwise you cannot see required results. In the current project, the idea came from the city management but it was not delegated properly. There were five different managers who were involved in the development. However, it is not enough that five managers bustle around the same topic, if no one takes a real responsibility. If no one has resources or possibility to concentrate on the development, the quality of the work is not good. (Manager responsible for customer processes)

The problems described above led to a situation that the recruitment of service users was passive. The interviewed professionals told that they felt unsure and did not have all the necessary information to start recruiting customers, as illustrated in the following citation.

> We did not have enough information to fully understand the concept. And because I did not understand it myself, it was not possible to market it to customers as a positive and good tool. (Representative A of therapeutic services)

11.4.2.2 Problems of the Digital Platform

The experiment was strongly technology-oriented: the digital platform played a central role in the basic idea of the model. On the other hand, the digital tool came 'out of the blue' to the practitioners – its preparation was in the hands of the management. This situation resulted in misunderstandings: the professionals did not know how the digital tool should be used in practice and what it meant for their daily work. The interviewees pointed out that the introduction of new digital platforms is time-consuming and requires learning and patience both from the service providers and from the users.

An additional problem emerged from the customized nature of the platform; it was not connected to the other IT platforms used by the professionals. Technically, it was very basic and traditional and did not support the idea of open data. The technical immaturity and problems related to it slowed down the implementation of the common service plan. The interviewees highlighted that the digital tools should work without problems right from the start to ensure the commitment of practitioners. They also called for more 'realism' in the introduction of digital tools: not all workplaces (e.g. daycare homes) have digital equipment, and it is not self-evident either that all users (e.g. immigrants) have computers. There may also be mistrust towards new technology and fears about lost information. The following citations describe these views:

> In a way, we thought that we could take certain parts from the new digitalized world and link them to the traditional way of providing services which is managed by professionals [and not engage users]. It was a mistake – we created a closed platform; it did not embrace the idea of open data. (Head of education and welfare services)

> I have seen the platform, but I have to use my private bank codes to get in, because I do not have the necessary equipment in my workplace. However, I have not made any comments on the platform as I do not even know whether I have enough skills to use it. (Representative A of prenatal and child health)

The success of the experiment would have required changes in the ways of working of professionals. In a digitalized world, citizen participation plays an essential role in the implementation of services and requires new professional competences and new ways of interaction. As they had not been properly considered in this experiment, citizen participation was low. There were also other problems that weakened participation. The customer group, which was selected to the experiment, was very demanding: the customers had multiple needs for social care and their life situations were often very difficult. Their needs were sensitive, which is why they required face-to-face contact, not digitalized services in the first place. According to the head of education and welfare services, a more successful strategy would have been to concentrate on children and adolescents with moderate problems. In this group, a digitalized platform with a common service plan might have genuinely worked.

> The experiment might have required that the professionals understand their new tasks: they should have been capable to help customers in the use of new digital services. Another issue is that we should have tested the common service plan first with customers who do not have serious problems and multiple needs for care. (Head of education and welfare services)

11.4.3 Challenges from the Nationwide Perspective

11.4.3.1 The Concept and Management of Experimental Development

The interviews of governmental representatives revealed more general viewpoints on the challenges of experimentation. According to the interviewed ministry advisors, one of the key problems is that practitioners do not understand the concept 'experimental development'. They are not familiar with this type of development and have not a clear understanding of what the implementation of an experiment requires from their organization. The fundamental insight about the close relationship between experimenting and learning is often missed, and therefore trial and error are not allowed. If the definition and structure of the experiment are not clear, too much time and resources are used for clarifying the terms and 'wondering the implementation'.

According to the ministerial interviewees, the conceptual vagueness is manifested as a lack of leadership and management and as an unplanned project – experimentation is seen to realize itself automatically. To improve the situation, an experiment should be understood as a process of continuous improvement, which requires careful planning as an integral part and the capacity to learn from mistakes. The interviewees thought that in the present case, the experimentation process was not designed properly and learning from the results was neglected. The following quotations illustrate the opinions related to the fundamental characteristics of experimental development:

> The characteristics of [experimental] development include the possibility to fail. If something does not work then we can try something else. However, this [learning] requires capacity to cope with the errors, document them and make new plans. (Ministerial Adviser A, Ministry of Health and Social Care).

> To carry out an experiment is challenging; too much time goes to clarifying the conceptual characteristics of the experiment. What happens after the experiment ends should have been thoroughly thought also… (Ministerial Adviser B, Ministry of Health and Social Care)

As seen in the last quote, the implementation of results and the creation of new services were raised as another challenge by the governmental interviewees. The projects typically lack dissemination plans, even though the next stages after the experiment should be a target right from the beginning. Some experiments have overcome this challenge and been capable of creating new services, but usually the changes have taken place in the experimenting organization only. Thus, the innovations created are not diffused at a wider scale, and significant impacts in service systems are missing. The interviewees admitted that this is partially caused by the lack of learning practices at the policy level. Common structures do not exist because of the administrative silos and poor collaboration between the ministries. 'Reinventing the wheel' is a trend that replaces learning from the experience of others. Consequently, experiments are detached from each other and good practices do not spread.

> Traditionally. the most difficult phase has been the step of implementing the project results and changing the activities. (Ministerial Adviser A, Ministry of Health and Social Care)

> A tool for assessing the customer's situation has been developed, but the question is to which activities it should be integrated or connected at the policy level. The lack of collaboration between ministries is a problem… A challenge in our social and health care system is that we have too many independent actors and organizations. These actors have a tendency of thinking that they are unique. This tendency is visible in services: every actor and organization wants to design services by themselves. (Ministerial Adviser B, Ministry of Health and Social Care)

The interview of the local head of education revealed additional problems in the interaction between the state level and local level. She argued that the support from national level was insufficient and therefore the cities included in the nationwide project were not able to create successfully new services. She considered that the issue is linked to the discontinuity of policies. In the present case, a particular challenge was a parliament election and the related change of the government in the middle of the experiment. The new government changed the focus of policies which affected on the continuation of the experiment – part of the resources allocated to it were transferred to other projects.

> At the same time, the government changed based on the new parliament, and the interest towards this experiment decreased. The experiment did not stop because it was planned to continue beyond the election, but the interest and resources were allocated to new efforts. (Head of education and welfare services)

11.4.3.2 The Role of Regulation and the Issue of Data Confidentiality

The interviewed ministerial advisers had identified a contradiction in the local desire for governmental advice. Local managers aim at relieving insecurities in the implementation of experiments by asking very strict instructions from the ministries. On the other hand, practitioners typically blame the existing instructions and feel that regulations diminish possibilities for collaboration between professionals. Common to both groups is the 'feeling of unclarity', which in social services is also justifiable due to diverse regulation; local managers and professionals have difficulties to know what is legal and what is not. Attitudes towards legislation vary, too – it is regarded as an enabler or as a barrier depending on the case. The ministerial actors themselves prefer a balanced view: they see instructions primarily as enabling, but do not favour nonregulated experimentation either. They believe that enabling directions enhances innovativeness and creates opportunities for experimental development.

> The responsibility of the grass root professionals should be increased – now professionals require too precise instructions. Strict regulation does not solve things; we need more enabling regulation. (Ministerial Adviser B, Ministry of Health and Social Care)

> The legislation in social care is not coherent…we have noticed it when we have started to develop digitalized services. (Ministerial Adviser B, Ministry of Health and Social Care)

The issue of regulation had caused debate in our experiment and was highlighted in the local-level interviews. A specific aspect linked to regulation is data confidentiality. The professionals understood the need to protect citizens' privacy, but they argued that the current regulation hinders necessary information transfer between professionals and hampers the development of new integrative practices. The interviewed Data Protection Ombudsman and his colleague formulated the problem differently: the use of customer data is allowed if the customer gives permission to it and if the data is linked to the customer case at hand. However, the professionals may have difficulties in defining the relevant information, and this makes them uncertain about their needs for information. Uncertainty leads to the fear of mistakes and consequently to the avoidance of cooperation.

The Data Protection Ombudsman noted that despite the sensitivity and the related challenges of the confidentiality issue, changes in the definition of confidential data are possible if they are made from the citizen-centric viewpoint and serve citizens' needs. The focus should be shifted from the service provider to citizens and to better and more holistic services to them. Customers' service needs should be considered central in any discussion between professionals. The role and power of IT systems is one problem that makes the situation difficult. Information management dominates the general management, resulting in a knowledge and leadership gap.

> Cooperation and information exchange among professionals are always possible if they are related to a specific customer need… However, irrelevant information, even if it concerns a specific customer, should not be passed to another professional. (Lawyer from the Office of Data Protection Ombudsman).

> The lack of knowledge about the data confidentiality leads to uncertainty. However, this uncertainty is not necessary. We should better describe customers rights: data should not be transparent and open to every professional, but its use should be linked to a specific case. The regulation related to the data confidentiality aims to protect customers against outsiders. However, the professional may experience it difficult to define who is an outsider. (Data Protection Ombudsman)

> There is no problem with information flow between professionals. I believe that the problem is the lack of expertise and management. The power of IT systems is difficult to overcome. Data protection does not prevent cooperation, but city managers can easily blame it. And if the managers do not know the situation, they cannot help the professionals, which should be their job. (Data Protection Ombudsman)

11.4.4 Lessons Learned from the Failed Experiment

Even though the common service plan was not implemented in the child and family services after some first trials, the interviewees agreed on its development potential. The following citations show that the central ideas of the experiment were considered valuable, and they were seen to provide a basis for the development of child and family service in the future:

> The only effective way to provide proactive child and family services is multi-professional collaboration and service integration… to support this development, we need integrated data systems instead of the fragmented systems that we currently use. In this experiment, we wanted to develop a comprehensive information reserve related to individuals' capacity to manage their lives. This is the direction in which the data systems will develop in the future. (Strategy manager)

> We need to find the good things and notice the things that did not go well in the experiment. There were people who learned from the experiment and from the failures they faced. Now they know that in the future things should be introduced in a different way. That is the learning even though the experiment did not succeed as desired. (Ministerial Adviser B, Ministry of Health and Social Care)

Thus, the interviewees underlined that the unsuccessful experiment was a valuable learning experience for the actors involved in the development work: it made the actors to understand the main pitfalls in the process. However, it was pointed out that the lessons learned need to be seriously and constructively analysed in order to make them as assets in the future experimental activities. The experiences were also considered important for the service provision in the future social and healthcare centres, which are planned as part of an ongoing renewal of social and healthcare in Finland. In the new care model, child and family services are planned in accordance with the key ideas of the experiment, as described by the manager responsible for customer processes:

> The service provision in the new social and health care centers is based on the same key ideas we had in our experiment. In the present social and health care renewal, all municipalities are forced to develop their child and family services according to the same model. They need to develop more integrated services. In our city, the experiment helps us to generate preparedness for the renewal. (Manager responsible for customer processes)

11.5 Concluding Discussion

Experimental approaches have been suggested as a successful innovation model in the current conditions of continuous and rapid changes. By integrating innovation and learning, and adaptive trial and error, they include a possibility to tackle the 'unknown' more efficiently than the approaches based on strong pre-planning. Experimental development has gained foothold in the public sector, too. Here it faces the specific challenges of administrative bureaucracy, top-down management and strong professional power. On the other hand, information technology creates new opportunities for overcoming professional silos and empowering citizens to participate in the production of services.

Our study examined a case project which aimed at developing a new integrated model of wellbeing in child and family services, based on multi-professional working. In the core of the new model was 'a common service plan' to which the user and the service providers commit themselves and a digital platform which functions as their mutual information channel. The project met multiple challenges and was

stopped before the planned deadline. However, it provided useful lessons for corresponding efforts in the future. In Table 11.2, we summarize the central findings that we have categorized on the basis of our theoretical frameworks: (1) the issues linked to the new kind of an innovation process (experimentation) and (2) the specific challenges of the public sector.

As regards the nature of the innovation process, our case was explicitly defined as a project of experimental innovation. It was part of a nationwide effort whose aim was to promote experimental practices in the public sector. However, a systematic process that would merge planning and implementation, according to the principles of experimentation, was missing in the case. Our results revealed that the concept and nature of experimental development were poorly known among the participants, and only the managers were aware of the aim of the project. The central role of learning, which is regarded as the main benefit of experiments in the literature (e.g. Engvall et al. 2001), was not emphasized. There was a contradiction between the basic idea of the integrated model of wellbeing and its implementation: the model highlighted the engagement of employees and service users, but the participation of grassroots professionals was not organized, and consequently the recruitment of users was passive.

The approaches of bricolage (Fuglsang 2010) and effectuation (Read et al. 2009) have suggested adaptive trial and error as the core approach in experimental innovation. They have also highlighted that an experiment is not the same as an unplanned process, but the problem at hand should be carefully framed and contextualized. In our case, the target of the project (customer processes in the integrated model) was well specified, but otherwise the requirements of an experiment seemed unfamiliar to the stakeholders. The applicability of experiment-based development in social care was not discussed, which was a severe shortcoming. Due to the sensitivity of the problems of customers, the use of the trial-and-error approach in this context should have been analysed in detail. Now, it turned out to be too challenging, but reasons behind this challenge remained unclear – lack of knowledge and poor organization of the project were intermingled with the real issues of customer situations. Another vulnerable point was the dependence of the experiment on governmental resources. This made the participants sceptical about the long-term continuity and resourcing of the new practices, which weakened their motivation.

Compared to the general challenges of innovation in the public sector, our case indicated that top-down practices are still strong. The interviewed managers were very eager about the renewal, but they did not acquire commitment from the grassroots level. On the other hand, occupational professionalism – which has been regarded as another typical barrier to the renewal of the public sector – was not an issue in our case. The participants had earlier experience of multi-professional work, and they were positive towards the introduction of new ways of interacting. The local leaders and managers were not, however, capable of seizing this important opportunity. Our case is an illustrative example of the lack of skills in innovation management in the public sector. The focus in the development was on the idea phase; the implementation took place as a ‘voluntary’ process, which made it secondary in the everyday work.

Table 11.2 Summary of the central findings of the study

Theoretical perspective	Research results	
Experiment-based innovation model		
	Application in the study case	**Challenges in the application**
Merging planning and implementation	The case was part of a nationwide exercise that explicitly aimed to promote experimenting in the public context	The concept and nature of experimental development were poorly known among the participants
Paying attention to learning during the innovation process	An explicit focus on learning missed	Only the managers knew the aim of the project. Deficient information among the practitioners prevented learning
Engaging users and grassroots employees	The basic idea of the integrated model of wellbeing included the collaboration between employees and service users	The participation of grassroots employees was not organized, and the recruitment of users was passive
Framing and contextualizing the problem at hand	The target of the development (customer processes in the integrated model) was well specified by the managers	The applicability of experiment-based development in the context of social care was not discussed and turned out to be too demanding
Fostering adaptive trial and error	Trial-and-error approach was not tested because the actual implementation of the new model was minimal	Trial and error could have been a risky approach due to the sensitivity of the problems of customers
Mobilizing necessary resources	The experiment was dependent on governmental resources. Reorganization of the work was not considered	The project was not prioritized among the practitioners; fear of extra workload weakened their motivation
Issues of the public sector		
Traditional bureaucracy	A top-down approach characterized the project	The project was built on the enthusiasm of a few managers; grassroots professionals were engaged too late
Professionalism	The case organization was on the way towards hybrid forms of professionalism, i.e. a combination of occupational and organizational professionalism	Professionalism was not an issue in the case. Multi-professional working was familiar among the practitioners, and attitudes towards it were positive
Innovation management	The top-down approach in the experiment focused on the basic idea and did not include systematic management of the innovation process	The lack of management and leadership made the experiment 'voluntary' and secondary in the everyday work

(continued)

Table 11.2 (continued)

Theoretical perspective	Research results	
Impacts of digitalization	A digital platform for wellbeing data was a central element in the experiment; it was targeted to support the interaction between professionals and service users	The need for a digital tool was not clear to the practitioners. The solution was 'cumbersome' and together with confidentiality issues caused mistrust
Interaction between local and governmental levels	Guidance from the responsible ministry is missed despite the nationwide effort. After the change of the government, experimental development was no more a focus in the political agenda	The practitioners were insecure about the actual impacts of the project, because they had experience on the discontinuity of policy initiatives. This weakened their motivation
Dissemination of innovations	Dissemination was not considered in the project plan at the local level and was not discussed in the state-level project either	Organization of dissemination was recognized as a problem by the governmental representatives

Our case also brought up experiences about the development of digitalization. A central element in the experiment was a digital platform whose purpose was to support the interaction between professionals and service users. However, the tailor-made, price-driven solution was not user-friendly, and the need for a digital tool was not clear to the practitioners. The missing discussion on the specificities of the application area – social care – turned out to be a problem again. In addition to the intra-organizational discussion, a discussion would have been necessary between the local level and the regulatory, governmental level. Our interviews revealed that the views on the interpretation of the confidentiality issues and on the related possibilities of multi-professional information exchange clearly differed between local professionals and governmental actors.

The views between these two levels also differed concerning the whole exercise. Guidance from the responsible ministry is missed despite the nationwide effort, and the practitioners were doubtful about the impacts of the project, because they had experience on the discontinuity of policy initiatives. Actually, this discontinuity was realized in our case: after the change of the government, experimental development was no more a focus in the political agenda. A problem at both the local and national levels was the lack of the dissemination plan for the results. Thus, our study confirmed the earlier observation that the spread of public innovations is typically weak (Moulaert et al. 2005). Local actors do not have resources for broader collaboration, and they do not see dissemination as their task. At the governmental level, common structures do not exist because of the administrative silos, and collaboration models that would facilitate learning are rare. In order to promote experimental development, and public innovation more generally, these shortcomings should be tackled. Learning in and between projects, accelerating the dissemination of good practices and common mechanisms and structures for them are required.

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Chapter 12
New Information Systems Supporting the Emotional Aspect of Care

Tom Hope

Abstract This chapter explores digitalization and services from the perspective of care, focusing on professional care in hospitals. After an overview of digitalization of healthcare, a project to develop a digital information system for nurses in a Japanese hospital is introduced. It serves as a case study of the challenges of digitalization in the context of caring practices where the emotional needs of those receiving and, significantly, providing care are central. The chapter argues that current Electronic Medical Records do not sufficiently allow for nurses to express their "caring mind"; thus, this should be a focus of further research.

Keywords Care · Health · Electronic Medical Records · Nursing

12.1 Introduction

The services of health and medicine are one of the most obvious areas to have been influenced by digitalization in the twenty-first century, and the research on this industry also emphasizes the importance of digitalization for the future of health and medicine. It is an important area to examine as the use of digital tools will affect future healthcare wherever they are introduced. However, the qualitative aspects of the technology being developed (and already in use) and the way in which it supports users' needs (McLoughlin et al. 2017; Mettler 2016; Tresp et al. 2016) have been the focus only rarely, leaving a gap in research to understand the use of new technologies. The research in the present chapter aims to address this gap.

Users of technologies need not be patients or doctors, but they are often the "middle ground" professional carers, namely, nurses. This chapter explores the digitalization of medical and healthcare with a focus on this particular profession: carers in hospitals. Our purpose is to understand how digital technology, such as

T. Hope (✉)
Tokyo Institute of Technology, Tokyo, Japan
e-mail: tomhope@tse.ens.titech.ac.jp

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information sharing systems, may improve care and to present problematic issues that should be addressed in the technology's uptake in the caring professions.

The chapter begins in this section with an overview of the digitalization of medical care and healthcare generally and gives examples from Japan. Japan serves as an interesting study locale as it was earlier leading the world in terms of innovation in health technologies but has fallen behind in recent years – spurring the government and industry to push for further innovation (McKinsey 2018; Cabinet Office of Japan 2019). Section 12.2 focuses on professional care in hospitals, exploring where digitalization fits with current caring practices conducted by nurses. This is followed by Sect. 12.3, where a research project named as "ShareCare" is introduced and analyzed as a case study; the aim is to find ways in which digital technology could be used effectively and innovatively by nurses to improve the quality of care and develop sharing of caring knowledge. The chapter is closed with some suggestions on how the field may be opened up to future research and practice.[1]

12.1.1 The Digitalization of Medical Care and Healthcare

The digitalization of medical care or healthcare is a rapidly developing field, in which the most obvious change is the accumulation of medical data. In fact, digitalization in this sector is often synonymous with digitization and electronic management of "medical" (more recently "health") records (e.g., see McLoughlin et al. 2017). However, digitalization also takes place in other areas of healthcare, and multiple attempts to categorize digital technologies have been made (see World Health Organization 2018 for a health system implementation approach, and Gastaldi and Corso 2012, for a case study approach). For the purposes of this chapter, we can make the following broad categorization: Medical and Health Records, Mobile Health Technologies, and Telemedicine and Online Support. This categorization is based upon the examination of hospital and associated technologies in the ShareCare case study described below, especially on the discussions with nurses and healthcare researchers in this project.

Dividing technologies into these three areas allows us to see the boundaries of data. Indeed, the technologies themselves may be "boundary objects" (McLoughlin et al. 2017) between different healthcare domains, seen differently from the perspective of hospitals and other domains of healthcare provision. Thus, our categorization of technologies into three areas represents a categorization according to boundary, as shown in Table 12.1. The table also shows the differing relationships that these technologies have with their users. Technologies such as Electronic Medical Records are usually used by medical practitioners; individual patients do not see this data. Online support portals are provided for users with health problems,

[1] This chapter explores digitalization, but there are other terms, such as "e-health" and "mHealth," that are used to refer to some of the technologies discussed. For a discussion on terms, see Otto et al. (2018)

Table 12.1 Categorization of technologies in digitalized healthcare

	Medical and Health Records	Mobile Health Technologies	Telemedicine and Online Support
Example technologies	Electronic Medical Records, Electronic Health Records, Personal Health Records	PDAs (mobile computers), sleep and fitness trackers, robotic aids, safety alarm wristbands, door alarms, fall detectors	Online support websites/ portals, videoconferencing
Hardware/ Software Innovation	Software	Hardware and Software	Software
Boundary of data	Medical institution (except for Personal Health Records)	Both medical institution and personal device	Medical institution, personal device, aggregated by government

but while shared with them, the data is usually held by medical institutions or aggregated for use by government or research. These two technologies are usually based on software innovation, relying on already existing infrastructure (such as web browsers or computer terminals), whereas innovation in Mobile Health concerns hardware, particularly in the case of robotic aids or wearable sensor-equipped fitness trackers. Robotic aids comprise a large research and development area, which encompasses social robots – often put in care homes or individual's homes (Pu et al. 2018) – or exoskeletons, used for rehabilitation or assistance of daily living (Jung and Ludden 2018). Robotic aids are therefore a good example of technologies that can stretch across the personal-institutional divide.

It should be noted that much of the digitalization in the twentieth century has taken place in those countries that already have infrastructure, presenting challenges in generalizing across countries. Developing countries, in particular, have not seen high levels of digitalization, although this is not to say that they have no digitalization at all (Cho et al. 2018).

12.1.1.1 Medical and Health Records

Although we should be careful not to simply repeat hype, one clear area of digitalization in medicine and healthcare has undoubtedly been the transformation of medical information from analogue, i.e., paper records, to Electronic Medical Records (EMRs) and the use of personal health data in Electronic Health Records (EHRs) (Wachter 2015). These Medical or Health Records are the recorded medical data taken from individual patients by doctors or other medical professionals in their diagnostic – and "caring" – interactions with them. They form an important part of the relationship between medical professionals and their patients, although this collating and categorization of information even in the analogue form has only been conducted regularly in relatively recent times. It actually started in the early twentieth century, when innovations in the use of clinical tools were conjoined with the

benefits of collecting and analyzing numerical medical information (Reiser 1991a, b). A visit to a clinic now entails the doctor inputting data into a computer, rather than writing on paper, and the X-rays and CT scans increasingly create digital data (Mestres 2017).

Delineating clear differences in these types of records is not easy, but again, the boundaries of data use can help. EMRs are usually confined to the hospital or clinic where they are created and contain information on a patient that is used to medically treat them in that hospital. EHRs, while often containing similar information (e.g., very basic data such as blood pressure), can contain additional information on lifestyle and may be seen by patients. This information may also be shared with other institutions, including institutions on a national scale. One issue for the implementation of EHRs in national scales, suggested by McLoughlin et al. in their recent book on the "digitalization of healthcare" (although it almost exclusively focuses on Electronic Health Records), is that "structure and infrastructure have tended to be conflated to areas away from medical records into personal health records" (McLoughlin et al. 2017: 150). Thus, the definition of an EMR as being something that belongs exclusively to a hospital – in effect simply a digital form of paper record – seems inaccurate in the light of recent developments of technology. As we will see in our study introduced later in this chapter, when including information on the caring of patients, EMRs may begin to look like EHRs or quite amorphous altogether.

12.1.1.2 Mobile Health Technologies and Sensors

A second area of digitalization of healthcare with a great potential, but yet to be adopted by the mainstream of medical institutions, is the use of mobile technologies for the collection of data on patients or users outside of medical settings. We can include here portable devices for the inputting of data into an EMR or EHR (often in this case called a Personal Health Record). They also include devices that are already owned by users, such as smartphones (Tang et al. 2006), technologies worn by the user such as sleep or fitness trackers (Jeon and Finkelstein 2015; Spiel et al. 2018), and sensors that collect data on users in their home (Biswas et al. 2010; Mukhopadhyay 2015). We can also include robotic aids such as those used in hospitals or care facilities to move patients (Hu et al. 2011) or to help with rehabilitation of patients. Among these technologies, the internationally most well-known Japanese technology is perhaps the "Hybrid Assistive Limb" (HAL) produced by Cyberdyne Inc., an exoskeleton-like robot worn by users to enable them to walk (Nilsson et al. 2014). We can also include older technologies in this category; an example is the now commonly implemented barcodes used to identify patients in hospital and linking them to their medical records and treatment (Wideman et al. 2005).

As Bhavnani et al. (2016) has argued, these mobile and sensor technologies have come about through the confluence of several movements: the increase of computing power (Moore's Law), a need to tackle the rise in the numbers of people suffering

from chronic diseases, and a movement toward patient-centric healthcare. Portable diagnostic tools are major disrupters, as "use of these devices at the point-of-care is resulting in a change in the method of healthcare delivery from one that was health-systems generated to one that is remote and patient generated" (Bhavnani et al. 2016: 1). Mobile apps and sensors on a chip can empower users to take control of their own health, both after diagnosis by a medical professional and prior to becoming ill. In Japan, a prominent example of technology already developed is the digestible sensor (produced by Otsuka Pharmaceutical and now also approved in the United States) that tracks when patients take the antipsychotic medication Abilify and via smartphone app informs their doctor of their compliance (Papola et al. 2018). CureApp Inc. (CureApp 2018), which originated as a smoking cessation smartphone app, has expanded to produce apps designed to help with mental health by providing online counseling based on cognitive behavioral therapy and an app to monitor patients while in the hospital and also during daily activities when outside.

12.1.1.3 Telemedicine, Big Data, and Online Support

The third broad area of digitalization of healthcare focuses on the transmission of data from one location to another or on providing access to databases of information. Many countries now have online support for patients, where users can obtain information about various health troubles via the Internet, accessed via desktop or mobile browsers or apps (Sbaffi and Rowley 2017). Unlike in some countries like the United Kingdom, with its National Health Service affording a central portal of information on medical conditions and a central telephone number for non-emergency inquiries (NHS 2018), information is more localized in Japan. Japan's insurance and medical provision are separate, and medical information is provided by local governments or individual hospitals. There is a central website provided by the Ministry of Health, Labor and Welfare (MHLW 2018), but its main function is to provide contact information on local governments or hospitals that deal with patients. Nevertheless, these types of online sites are beneficial for individuals who live in rural areas and perhaps have less easy access to medical facilities.

A key trend in this area is the use of aggregated data to improve diagnoses and predict diseases before they appear in the population (Raghupathi and Raghupathi 2014). The sources of data that comprise this Big Data come from the technologies in the two areas described above: (1) from hospitals via Electronic Medical Records, lab reports, and medical imaging and (2) via apps used by patients or healthy individuals monitoring their own physical and mental conditions. Data can also be obtained from social media; for example, twitter can be mined to monitor outbreaks of disease (Signorini et al. 2011). Another source of data is online services that collect DNA data from users via mail-order kits (Nordgren and Juengst 2009). This aggregated data may also be useful in the education of professional medical staff and for patients themselves as they learn about their own conditions. The information can be analyzed as anonymized Big Data, or it can be integrated on a more individual level into what has been called "integrated" or "total" healthcare (Jeong et al. 2012).

An example of this in Japan can be seen in the push by the government. A 2015 report, *Japan Vision: Health Care 2035* (Health Care 2035 Advisory Panel 2015), produced for the health minister, suggests that Japanese healthcare moves from cure to care and to integrated rather than specialized approaches – this being a paradigm shift for the country (Sakamoto et al. 2018).

Finally, it should be noted that the ability to provide information regardless of the physical location is a focus of innovation in developing countries. This telemedicine can be provided with very little advanced technology, such as via cellular phones or online at internet cafes (Kamsu-Foguem and Foguem 2014).

12.1.2 The Context of Digitalization of Healthcare in Japan

All of the above-described innovations of digitalization of healthcare are applied in Japan to greater or lesser extents. The government has generally had a favorable attitude toward using digital technologies to support and improve medical and care practice. Robots often appear in overseas news reports, showing the futuristic image of Japan particularly in the West, but it is no lie to state that robots are seen as an important part of the future healthcare industry in the country. A Japanese government white paper in 2015 (METI 2015) clearly stated this aim, suggesting that robotics, in particular, will be used to aid nurses, especially in rural areas where the number of nursing staff is viewed to be inadequate as society ages. The white paper states:

> …through accumulation of health and life data and communication with old people, measures to promote introduction of robots with sensor technologies and artificial intelligence will be pushed forward with an eye on looking after the aged and preventing them from falling prey to a serious disease such as dementia. (METI 2015: 63)

Japan is not simply an aging society, but it has increasingly been named as one of the first countries to become "super-aged." Japanese people on average have one of the longest life expectancies in the world. Already around a quarter of the population is over 65 years old (this figure was passed a few years ago), and by 2050, over-65s will be nearly 40%. By 2030 – a rapidly approaching date – one in five members of the population is expected to be over 75 (Muramatsu and Akiyama 2011). The total population is in severe decline, from 127 million now to potentially a predicted 80 million in 2060 (NIPSSR 2012). With fewer births and longer lifespans, the country has a top-heavy population pyramid. Japan experiences a problem of an increasing ratio of older (in other words "over-65") people to those of working age. It is thus leading the world in a well-publicized crisis in the pension and welfare system, as there are not enough young workers paying enough into the system to support the needs of the older citizens. The Japanese government, fully aware of these problems, has gradually begun implementing some policies, such as increasing the number of overseas worker trainees, but the country is relatively opposed to long-term immigration (Peng 2016). A lack of nursing staff and other professional

carers is a prominent part of this crisis: an aging (or "super-aged") society has urgent need for means to care for its aged. This means that the environment is ripe for innovations in digitalization in all sectors, including medicine and health.

So, what of the digitalization of healthcare in Japan – the EMRs and futuristic robots – that we see in the media?[2] Is it fair to say that Japan leads the world in this respect? Unfortunately, in contrast to the research projects produced and a desire by the government, the adoption is not as high as it could be. For example, according to a government survey, only 32.2% of hospitals and 35% of clinics in Japan had adopted EMRs in 2014, and there were large regional differences in adoption (Kawaguchi et al. 2018). Smaller hospitals, in particular, have received less funding for adoption than larger hospitals (Yoshida et al. 2013). Robotics so far is not faring much better. Conclusive figures are hard to find, but a recent survey showed that care robots were only installed in 1.8% of care facilities – note though that this includes care homes where the uptake of digital technologies may be less than in hospitals (Care Work Foundation 2018). The government has high hopes for the potential of Big Data to positively affect healthcare in the country, naming this "IT-infused but human-centered future": "Society 5.0" (Cabinet Office 2019). This kind of development is also supported by the large industry players in the country (Japan Business Federation (*Keidanren*) 2018). The future, then, potentially looks like new technologies, and analysis could be major disruptors, but at present the effects are minimal for some of the more radical technologies.

12.2 The Practice of Professional Care in Hospitals

Care in its theoretical and practical forms is a part of the medical field in all countries where Western medicine is practiced. It is not, however, always the central touching point that patients have in their contact with hospitals, as "cure" rather than care is a primary function of hospitals (Weiss and Lonnquist 2017). What we are seeing in developed countries is a shift away from simply curing a patient and then sending them home to having to deal with more chronic conditions, often related to aging. This means that caring for patients who may be in hospital for lengthy periods or who use the hospital frequently becomes essential work for hospital staff, predominantly nurses. In Japan, aged patients with chronic conditions are often in care homes supported by non-nursing staff (or assistant nurses). They can also be cared for by nonprofessional carers, usually relatives, at home (Miwa et al. 2016) and visit hospital regularly or receive treatment by nurses sent from hospitals or clinics. As 31.8% of all people over 75 years use nursing care services, and an aging population coincides with the lack of nursing staff, we can expect a push for digital technologies to become more central in the care of the elderly (ibid.).

[2] See, for example, "Six Japanese robots that care for an ageing population," *Financial Times*, December 8, 2017, https://www.ft.com/content/6802f840-caf8-11e7-8536-d321d0d897a3

While the role of a doctor is traditionally to diagnose and treat patients, nurses are usually involved primarily in treatment, administrative tasks (such as collecting information from patients and their families upon entrance into the hospital), and care of patients during their hospital stay. Theories of nursing include "nursing as caring" (Boykin and Shoenhofer 2015), putting care as a key component of the work of nurses. As Boykin and Schoenhofer (2015: 343) have argued, caring is not unique to nursing, but "as a discipline and a profession, nursing uniquely focuses on caring as its central value." They suggest that caring in nursing is dynamic and cannot be restricted to a simple definition but highlights the complex interpersonal work that nurses engage in.

In attempting to understand care, and in the context of the study introduced in Sect. 12.3 below, it is useful to consider the "ethics of care," as this moral position defines the work of a carer, providing – other than financial incentive or familial obligation – a central motivation for caring. In some cases, care may be viewed as a biological necessity. Shakespeare (2006), for example, in examining caring in the context of disabilities and disability studies, explores the contradictions in Western thought and democracy. According to him, they support the idea of individual, rational, independent, and cognitively "unimpaired" agents with the inescapable realities of needing to receive or give care at some point of life. He explores some of the care and support needs that people are likely to be engaged in; the study focuses on babies and children and those with impairments. In hospitals, nurses see all of these and approach the caring of them within the professional bounds of their training.

What is the ethics of care and how might it affect the digitalization of healthcare in hospitals? It is not a cold, purely reasoned approach to relationships with individuals. It may not be easily rationalized. As Held (2006) has argued:

> the ethics of care values emotion rather than rejects it. Not all emotion is valued, of course, but in contrast with the dominant rationalist approaches, such emotions as sympathy, empathy, sensitivity, and responsiveness are seen as the kind of moral emotions that need to be cultivated. (Held 2006:10)

Care, then, is an emotional morality, and this feeds into the actions of care, for emotion and action are difficult to separate. Yet, as we will see below, the digitalization of healthcare in hospitals has left nurses with difficulties in fully expressing this ethics of care.

12.3 The ShareCare Project[3]

In this section, the research project headed by the author and known as "ShareCare[4]" will be briefly introduced and used to explore further some of the issues raised previously. The ShareCare project is a 3-year funded multidisciplinary study

[3] This project has been supported by *grants-in-aid for scientific research (Kakenhi)* number 16H02916.

[4] For further information about the project, see the website: http://labhope.com/medsharecare/

comprised of researchers in computer science and engineering, nurses and medicine, design and art, and sociology.

12.3.1 Overview

The project began as an effort to improve the information services used by nursing staff in a hospital in the west of Japan in 2012. The author joined the project in 2015 with an aim to focus specifically on the electronic medical records used. From 2016, he gained funding for team members to develop the research into designing and building a service for the nursing staff. The original research problem was constructed around developing improved portable information input and retrieval systems, based on those already used in the hospital. Nurses at the hospital use portable tablet-type computers where they can input data from their rounds, but the system is not used as much as it could be – in fact, one of the first things the author noticed on his first visit was just how much paper is still used by the nursing staff in their daily work. This is of course a common theme in human-computer interaction studies in many different work settings: paper is a very useful and "mobile" technology (Luff and Heath 1998).

As the project progressed in 2013 and 2014, research moved toward how to enable the nursing staff at the hospital to express "caring" or what we have tentatively called a "caring mind" to, with, and for each other in the hospital. This topic emerged from discussions and workshops where it became clear that the nurses wish to express this "mind" with each other, but it was difficult to officially do as part of their work or with the current technologies in use. While our initial focus was on the technology, the nurses themselves emphasized how important the caring mind was in their work; on the other hand, they felt it was somehow being lost through changes in technology. Thus, the study became centered less specifically around the portable computer technology and more and more on the social interaction and use of the existent medical records that nurses had contact with in their daily work.

The hospital is a large university hospital in the west of Japan – the main hospital in the city – which has a strong reputation in the area of nursing and nursing education. The participants of the study at the hospital are head nurses, being those in charge of different departments, managing beds and other nurses; in addition, more junior nurses have been interviewed, and they have taken part in workshops. As the research project has developed, rapport has become strong, and senior nursing members at the hospital have become quite invested in it, seeing it as potentially beneficial in the education of junior nursing staff. Because the hospital is a university hospital, carrying out corresponding tasks in addition to duties of treatment and care, it has a research remit. Findings from research are reported by the chief nurses in nursing research conferences and journals, allowing them to treat the project, not as an external task but as part of their own work.

12.3.1.1 Research Methodology

The research methods were qualitative in nature, to adequately capture the "real life and richness" of nurses' caring in the hospital. During the first year of the research period, two 2-hour long co-design workshops were conducted, with five senior nurses in the first and five senior and five junior nurses in the second workshop. The workshop data was combined with transcribed data from semi-structured interviews, conducted with 16 nurses (junior and senior) in the second year of the project. The co-design workshops asked nurses to take the researchers through the typical process of entry into a medical record, from admission of a patient to their leaving hospital. The nurses were also asked to annotate what they did, and what they felt was included or lost by paper and digital records. Additionally, five "expression" workshops were conducted, where senior and junior nurses worked together to create textual and visual representations of their nursing, focusing on pieces of technology that were particularly significant to them. These latter workshops particularly explored the "nursing as caring" paradigm, as nurses were keen to express the ways they cared for patients with or without technology.

Data from the workshops and transcribed interviews were put into qualitative data analysis software (NViVo) and categorized first according to the medium used (paper or digital) to focus on this aspect. Then, further coding was carried out to uncover themes of caring in practice. Reports were regularly given either in person or via online conferencing with the chief nursing staff. Hearing the feedback has been essential for the way the project has developed, particularly in regard to the use of further workshops. The nurses felt these workshops to be very valuable exercises in expressing their experience of nursing; now they organize these kinds of workshops themselves.

12.3.2 How Nurses Share Information of Care

Our study shows that nurses start collecting information from the beginning of patients' entrance to the hospital. They have responsibility to gather as much information as possible in a short period of time to enable the hospital to successfully treat the patient. This takes the form of an interview (nursing admission assessment) with patients and/or their families to note medical history and aspects directly related to care, such as family background and dietary requirements. This is entered into the medical record, and thus the patients' hospital journey begins along with the nurses' caring relationships with them.

A note must be given on terminology in Japan. There are in fact many terms that can be used for "care." In the medical context, "care" in Japanese is usually translated as *kaigo*. Nursing is *kango*. In addition, there is an imported term, *kea*, which also refers to care; it is often used, for example, in the context of day care, care homes, and so on. The difference between *kaigo* and *kango* is a little confusing, especially when we consider the movement toward community care. However, from the

research viewpoint, there is an important specification linked to *kango*: nurses have undergone professional nursing training prior to and during their work in hospitals. There are different guidelines, qualifications, research associations, and official bodies that the research participants have had to grapple with. On the other hand, in research on digitalization, it is also necessary to remain objectively distant from this structure, no less when we look at aging society and the care of older people which are increasingly the case in Japan. Thinking about the ethics of caring, we can again consider the view of Shakespeare (2006, p151):

> Different forms of care are needed that support individuals in appropriate ways, which enable them to flourish and achieve their projects… Whatever form of care and support is adopted needs to be based on respect for both parties—those who deliver care and support and those who receive it.

In fact, for both the giver and receiver of care, the practices of *kaigo* and *kango*, which in many respects are different, contain some common elements of "care" or "caring mind." A major concern of the head nurses in the ShareCare project has been the changes of work practices and the perceived demise of a sense or understanding of care in nursing. Part of this concern may be due to digitalization – as is discussed below, digitalization can very easily support box-ticking and utilitarianism. The changing work environment has also made nurses busier; they have to care for more patients, which leaves less time to commit to the practice of composing text in medical records. In this respect, electronic records facilitate more efficient data entry, but as we heard in workshops with the nurses, the *effort of writing* in paper records for information sharing was connected to expressing care for their patients.

In interviews and design workshops with the head nurses, we learned about the use of paper records in the past and about the ways in which nurses share information with other nurses, particularly for the important handoff of responsibility of patients during shift changes (Riesenberg et al. 2010). Prior to the new EMR system, nurses, in addition to their notes in the paper records, would have a notebook where they write information about caring for a patient. This was often not medically essential information, but its purpose was to make the patient more comfortable: to show, for example, the best way to serve snacks or which ear they were hard of hearing in (and thus which way to orient a bed or talk to them was best). These notes would be shared in the nurses' room and aid in the handoff period. The interviewed head nurses mourned the loss of this type of information in the new electronic records. This observation is in line with other work on EMRs and handoffs that suggests that patient summaries only are insufficient to support this crucial handoff task (Staggers et al. 2011).

During the study, we have seen how paper notebooks continue to be used by nurses, including more junior nurses who are not familiar at all with paper medical records. An enlightening moment was during a workshop when the head nurses showed actual paper records to the junior nurses, this being the first time the junior nurses had seen them. The junior nurses were shocked at the bulk of the records – patients with chronic illnesses would often have several books filled with their

information – and both junior and senior nurses excitedly explored how these records were written and used. It became clear at this stage that the workshops themselves were affording the sharing of the "caring mind."

12.3.3 Nursing Within the Digitalized Environment

Many of the patients in our case hospital are older people, and as we saw earlier, the number of patients over 75 years old is expected to continue to increase. Individuals around that age and above tend to have chronic illnesses, and this was something that was reflected in the nurses' comments on paper medical records. Paper has a unique way of helping build a narrative of patients that digital records have so far failed to replicate. Nurses commented that the sight of a thick paper medical record, and its weight, would tell them something about the patient – that their condition was chronic or serious. They would be able to flick through this type of record and quickly assess the condition. Of course, they would often know these patients quite well after caring for them for so long. Some of this type of tangible "feeling" for older patients through their medical records seems to be lost with the move to digital systems. We asked how the nurses used the present EMRs and any other means to replace what was lost. Table 12.2 shows sample comments given by the nurses.

It has become clear that senior nurses remember fondly how the paper records afforded ways of expressing caring; the weight of a line-stroke or a blank area can show other nurses the commitment of the authoring nurse over the patient they are writing about. A thick record itself can speak to a nurse about the "weight" of a patient's illness. Writing in long-hand in these records took time, but that itself was viewed as part of the "caring mind." Old information remains in the record as new information is added, allowing for nurses to recognize quickly the history of that patient. In contrast, EMRs seemed to lose this affordance for the senior nurses; they consist instead of pull-down menus and check boxes. For senior nurses, this showed something of the change in mind of nursing, something that they felt was problematic.

Nursing at the hospital is founded on a principle of primary care, with one nurse having primary responsibility for a patient. This seems to fit with ethics of care that emphasize relations between carer and patient. However, with the changes in labor, this primary nursing is threatened, especially at smaller hospitals. We can see in our

Table 12.2 Sample comments about paper and digital medical records

Event	Media	Comment
Writing a note about a patient	Paper	"Felt the weight doubly because it was about a patient and was handwritten with ball point pen"
Viewing history of patient who re-enters hospital	Digital	"Can know about the patient in a short time"
Filtering to access specific information	Digital	"Can find information without leaving the patients side"

research that this may reflect a generational difference between senior nurses, to whom primary nursing was an expected and achievable aim, and up and coming nurses who still have the expectation but will face difficulties to achieve it in some settings. Indeed, generational differences were expressed in the views of our research participants, most notably in two respects: in the narratives of care given by the senior nurses and in the interactions with records by the junior nurses. Regarding the former, we heard from senior nurses how the understanding of caring for older patients, especially the "caring mind," differed from junior nurses, "because nowadays children are not expected to care for their parents." The latter viewpoint was manifested in how junior nurses seem to have no expectations that they will carefully craft textual descriptions of their patients and their care in the medical records. Not being familiar with paper records means that their interactions with records and the relationship to actions of care with older patients are a little more checklist-like. The procedural adequacy combined with a perceived lack of "caring mind" – in the eyes of senior nurses – is demonstrated clearly by an example about handing an apple to an older patient:

> I directed the junior nurse to give an apple to Mr. A. They just gave an apple, *whole*.

This example was used to show the (perceived) lack of home care experience in dealing with older people who may have difficulties in chewing or manipulating with their hands. They saw younger nurses as lacking the "common sensical" caring mind, and there was little opportunity to include this in the EMRs. Younger nurses commented on the efficiency of EMRs, giving them extra time to spend by the bedside of patients. It is notable that even these junior nurses carried small paper notebooks with them, using them as their own personal checklists to maintain the quality of their care. Where notes on caring were included in EMRs, those records begin to look similar to EHRs, and we can predict that should EHRs become the norm, caring information inputted by nurses and other carers would be an important aspect of their content. One of the clear findings of the ShareCare study is that nurses, both senior and junior, desire to have an ability to include caring information, suggestive of their "caring mind," in electronic records.

12.4 Discussion and Future Research

This chapter has briefly explored the digitalization of healthcare by focusing particularly on the experience of nurses at a large hospital. The chapter began by introducing three areas of digitalization: Medical and Health Records, Mobile Health Technologies, and Telemedicine and Online Support. In professional care settings, such as a hospital, the first two can increasingly merge, the hospital becoming a nexus where information produced by doctors and clinicians, nurses, and the patients themselves is processed and utilized to improve the medical treatment and care of patients. As we can see based on the ShareCare project, there is a desire from those responsible for the care of patients to add other information considered

important. Nurses regularly input data via portable devices, although much is still done at computer terminals in the wards.

The latter area of telemedicine and online support is where the issues raised by the project will become in urgent need of address. In the case hospital, the need to share caring information is not presently deemed to be answered in a truly effective manner since the change to EMRs from paper records. What will happen when this deficit in information is transferred outside of the hospital to other care facilities or to carers at home is a question that should be dealt with. In the move to digitalization of healthcare, the "personal touch" can so easily be lost, and in developed countries with aging societies such as Japan, less care will be provided in hospitals compared with that offered at home. For the benefit of the carers and those under their care, future research should tackle this issue. Due to the localized context of care in practice, the digital sharing of information outside of hospitals or care communities nationwide or wider may also be hindered. This should not be seen as a shortfall in itself, for, as we have seen in the ShareCare project, nurses themselves value their local knowledge and the culture of care in their own work setting, but how this fits with the digitalization of healthcare is a question for future study.

As the ShareCare project has developed, one thing has become very clear in analysis of the workshops and interviews: the medical and health information used by nurses is not bounded by the technologies they presently use. Although EMRs are now the core of the information sharing at the hospital, nurses continue to use their own paper notebooks or "scraps" (Hardey et al. 2000) of paper containing information about patients. This amorphous nature of information extends to the desires of the nurses, as they wished to share information that is not included in EMRs but which they deemed essential aspects of their "caring mind." There was a desire for some sort of social messaging feature, similar to that used by the staff outside of their hospital work – to arrange, for example, social occasions – where they would be able to share information about patients' needs or mental conditions. Nurses want their patients to be comfortable, and they also want to express to their colleagues that they are responsibly caring for them. The ethics of care, as a need to express emotional connections with their work, their patients, and their colleagues, arose as a strong finding from the workshops. In fact, the workshops themselves were seen as invaluable by the nurses. Particularly the workshops, where they were asked to create textual and visual representations, provided powerful moments of catharsis, as the nurses read out their texts and described their pictures to each other.

The digitalization of healthcare appears to be happening regardless of any concerns. The findings from our study will be used to create tools to help with the expression of caring mind in a workshop format and elsewhere in the workplace or home. One area in which digitalization of healthcare may use these tools is the education of nurses throughout their career. Nursing has to move with the times, but the concerns of senior nurses appear to be valid: digitalization brings with it risks of rationalization. It may have positive effects in the efficient, rapid diagnosis of diseases in populations or in the speed with which information can be transferred to insurance agents and help with the payment of health fees, but rationalization risks

depersonalization. Senior nurses in our study were concerned that the caring mind is being lost within the digitalization of healthcare and the ethics of care, which demands further research to enable the emotional aspects to remain at the center of caring practice.

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Part IV
Understanding the Interaction Between Digital and Human Resources

Chapter 13
Reframing Autonomy: My Data, Our Data, and the Question of Human Dignity

Nina Janasik

Abstract Recent research argues that in order to become an efficient alternative in the current data economy, individualistic and human-centric data activism—for example, the MyData movement—needs to become more intertwined with social science perspectives that explore the socioeconomic contexts in which the new technologies are eventually embedded. Only in this way can a synthetic and more reflective citizen-centric data activism be formed. This development toward a synthesis of technology and society is already materializing in discussions and practices around data-driven initiatives and infrastructures that move beyond the individual level to think collectively for the social good. These initiatives share an "OurData" approach rather than the "MyData" approach. Emphasis is not on the individual's right to privacy and mastery over personal data based on human-centric considerations of human dignity, but the framing of the data initiatives starts from the notion that much personal data is fundamentally social and relational in nature and therefore exceeds the individualistic and human-centric perspective at the outset. In this chapter, I argue that the contrast between MyData and OurData reflects not only differences in the social imaginaries underpinning them but also different ways of conceptualizing the basis of human dignity. More specifically, I argue that the "anthropocentric" understanding of the individualistic view of human dignity (My) needs to be complemented with the "relational" understanding of the collective view (Our) to form a synthetic "anthropo-eccentric" view capable of addressing the complex challenges to all data activism posed by constitutive data, that is, data that in some way defines us.

Keywords Human-centric innovation · Autonomy · Privacy · Unborn · Philosophical underpinnings

N. Janasik (✉)
Consumer Society Research Centre, University of Helsinki, Helsinki, Finland
e-mail: nina.janasik@helsinki.fi

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13.1 Introduction

Recently, there has been an upsurge in data activist initiatives that wish to emphasize human-centric rather than organization-centric takes on personal data (see, e.g., Janasik-Honkela and Ruckenstein 2016; Milan and Gutierrez 2015; Lehtiniemi and Ruckenstein 2019). According to proponents of such initiatives, although data cannot be *owned* by individuals, at least it can be *controlled* by them. Indeed, many such initiatives take the possibility of such management to be a central digital human right (Poikola et al. 2014, 2015). The recent Finnish "MyData" data activist initiative is no exception. As has been shown by Janasik-Honkela and Ruckenstein (2016) as well as Lehtiniemi and Ruckstein (2019), the reliance of the MyData initiative upon the powerful ethical principle of human self-determination or autonomy as the basis for inalienable rights and liberties is strong (see also Taylor 1989, 2002; Floridi 2016). From the point of view of philosophical underpinnings, the idea of MyData and similar initiatives is that the exploitation of data subjects by organizations is to be counteracted by data activists aware of their own dignity as autonomous human beings (Janasik-Honkela and Ruckenstein 2016; Lehtiniemi and Ruckenstein 2019).

Yet, lately, the concern has been voiced that this highly individualistic, rights-based approach might lead not to loosening the grip of data-exploiting organizations over data subjects but rather to the strengthening of this exploitative grip (Janasik-Honkela and Ruckenstein 2016). This unfortunate turn takes place through processes of ever-expanding datafication, further reliance on data utilization, and the opening of data flows to monetization and competition (Janasik-Honkela and Ruckenstein 2016). As a corrective, it has been suggested that the MyData vision should broaden its scope to explicitly include social structure. More specifically, it has been proposed that notions of desired and undesired data use by means of data governance that goes beyond individual control should be developed in a way that combines the individual-centered technological social imaginary of infrastructure developers with the socio-critical imaginary of social scientists engaging with processes of datafication (Lehtiniemi and Ruckenstein 2019). In particular, it has been suggested that data that are in some sense constitutive for data subjects should be prudentially limited (Floridi 2016). From the point of view of philosophical and social underpinnings, the rationale behind such corrective measures is an insight into the fundamentally social and relational nature of many of our engagements with personal data and of the need to take this into account in attempts at modulating the power of the organizations currently handling such data.

In the case of most data that is constitutive for data subjects, it is possible to maintain that the ultimate reason that we need to develop practices of data governance that go beyond individual control is the protection of the dignity of the autonomous human subject (Floridi 2016). What, however, are we to do with *unborn* personal data, that is, with the personal data that is indeed constitutive but not of a *living* human being but of a human being *yet to be* (Lupton 2013; Johnson 2014)? Or to complicate matters still, with the constitutive personal data of a *dead unborn*

human being? Are these data to be taken to be under the control of the mother, as is the very life of the unborn in most Western legislation, although the data in question is not hers but the unborn human subject's? If so, is the dignity of the unborn an extension of the dignity of the mother? However, in this case the data is clearly *not* constitutive of the mother, but instead of the potential human being, who, however, is not yet an entity capable of holding any individual rights whatsoever, let alone exercising some sort of control in relation to those rights. Who, then, should control this data, and how? And what would be the ultimate grounds—the philosophical underpinnings or "philosophical anthropology" (Floridi 2016)—for considering some uses of this specific data to be strictly off limits?

In this chapter, I argue that from the point of view of philosophical underpinnings of current views on human dignity, the case of the *constitutive data of the unborn* represents the point at which the philosophical presuppositions behind individualistic data activist initiatives such as MyData break down. It represents the point at which searching for some sort of collectively agreed upon data governance rules becomes not only something which it would be good to have on top of various individualistic technological and infrastructural constructions but an absolute necessity. I also argue that in relation to this intricate case, the suggestion presented in the legal literature on the General Data Protection Regulation (GDPR) to view the unborn as *separate* data subjects and their parents as only holding "parental responsibilities" in relation to the constitutive data of these separate data subjects represents a first step in this direction (Pormeister and Drożdżowski 2018). However, I also argue that this first step remains fraught with difficulties from both a philosophical and a social point of view. Finally, I argue that of all the existing philosophical underpinnings for human dignity available to our cultural sphere, the one most capable of dealing with the intricacies presented by the case of the unborn would appear to be the "anthropo-eccentric" one developed by Floridi (2016). In contrast to the classically human-centered approaches to the basis of human dignity, such as being the image of God, this approach to the topic of human dignity takes our constant state of becoming in relation to, and of being fundamentally vulnerable to, each other as an explicit starting point.

In the rest of this chapter, I will explore and justify these claims and conclusions in relation to an empirical example, that of the Digital Maternity Clinic as developed in Finland in the beginning of the twenty-first century. The Digital Maternity Clinic *Ipana Motherhood* (*ipana* is Finnish for "little child") forms part of a larger societal endeavor to digitalize Finnish healthcare, which in turn forms part of what Lupton (2014) has characterized as the third wave of digital technology adoption in Western healthcare (see also the Introduction and Pekkarinen et al., Chap. 14, in this volume). Whereas the first wave consisted of the automatization of standardized and repetitive tasks in the 1950s, and the second involved the incorporation of health informatics and electronic health card systems in the 1970s, this third wave "sees moves toward the digitization of as many elements of healthcare as possible and the interaction and exchange of data between different institutions and systems" (Lupton 2014, p. 4). In its aim to integrate practices and functions that previously have been both organizationally and temporally separate and materially anchored

(e.g., centered in the pre-digital cardboard maternity card) into one service package, the Digital Maternity Clinic forms a prime example of such overall digitization processes. As I will later show, it is also bearer of the many privacy challenges pertaining to such efforts. In order to address these adequately, however, I begin by discussing some of the most central philosophical anthropologies or ways of justifying human dignity.

13.2 Theoretical Background

13.2.1 Five Philosophical Anthropologies

In an interesting article in *Philosophy of Technology*, Luciano Floridi claims that all protection of privacy should be based directly on the protection of "human dignity, not indirectly, through other rights such as that to property or freedom of expression" (2016, p. 308). This view is also reflected in the GDPR, which indicates that rules "shall include suitable and specific measures to safeguard the data subject's human dignity, legitimate interests and fundamental rights" (GDPR 2016). As Floridi immediately goes on to notice, however, making privacy rest on the foundation of the dignity of the human being runs the risk of avoiding a number of real problems to do with human dignity; for "unless one explains convincingly what human dignity may mean in the twenty-first century, it remains obscure and questionable exactly *which* interpretation of human dignity may provide the foundation for privacy (as well as all other human rights), and hence *why*" (2016, p. 308).

Put another way, in order to ensure the justification of privacy, we need to be able to explicitly open up the "philosophical anthropology" that we base our views of human dignity on, namely, its philosophical underpinnings: "that is, a philosophical understanding of human nature that is adequate to the digital age and our information societies" (2016, p. 308). This is especially important when it comes to *constitutive data*, i.e., the data that in some way defines us. Just as it is important to "protect children's privacy exactly because ICTs are technologies that shape the self" (Floridi 2014: 122) and children are the most vulnerable from this point of view too, in a contrary move, we might "relax our attitude towards some kinds of 'dead personal information' that, like 'dead pieces of oneself', are not really, or no longer, constitutive of ourselves" (Floridi 2014, p. 122; see also Floridi 2005).

What, then, are the foundations on which the dignity of human (data) subjects can be said to rest? Western societies historically recognize four different ways of answering this question. The first is Greek and Roman philosophy, which accords a human being dignity by virtue of his or her "natural and unique ability of exercising virtuous control over itself (e.g. passions) and its environment (e.g. animals)" (Floridi 2016, p. 309). The second is Christian philosophy, according to which human specialness in terms of dignity or exceptionalism is grounded on "humanity's divine creation and existence in the image and likeness of God" (2016: 309).

Thirdly, the basis for human dignity has, in modern philosophy, been based on "humanity's rational autonomy and the ability of self-determination" (ibid., p. 309). And fourth and lastly, the exceptional value of human beings has by postmodernity been said to lie solidly on "humanity's social recognition of each other's value" (ibid., p. 309).

However, according to Floridi (2016), the problem with all of these ways of justifying the exceptional value of specifically human beings is the recent advances in human science and technology. As the cavalcade of thinkers and scientists such as Copernicus, Darwin, Freud, and Turing have shown, "we are not at the center of the cosmos, of the biological kingdom, of the space of reason, or of the infosphere" (ibid., p. 309). The challenge then becomes to develop some sort of philosophical anthropology, some sort of solid philosophical underpinnings for our informational times that *both* manages to function as a foundation for human dignity *and* avoids the pitfalls of anthropocentric exceptionalism. But where should we go to fetch the ingredients for such a middle-ground view?

Floridi (2016) suggests that we can acquire such a solid ground from the modern *anthropocentric yet decentralized* ethics of care in conjunction with the "eccentric" major Renaissance thinker Pico della Mirandola. As the ethics of care is based "on the decentralization of the agent in favor of the patient (receiver) of the moral actions" (ibid., p. 309), it suggests that a decentralized approach to human exceptionalism is indeed both possible and viable. Pico della Mirandola again put forward the view that human value and greatness reside in him and her being *polytropos*, which roughly translates to being cunning in our travels and wanderings around the world, somewhat in the sense of Odysseus. The notion describes "someone who has seen the world, may be street-wise, much-travelled and much-wandering" (ibid., p. 310). Most importantly, as such travelers, "we are in the hands of our hosts: the others, nature, our physical world, but also society, culture, the world we build, not just the world we find" (ibid., p. 310). These encounters with our hosts are far from trivial; on the contrary, they are *constitutive* for who we are, for our identity as human beings. As are indeed, in our informational times, our data: the "'my' in 'my data' is not the same 'my' as in 'my car', it is the same 'my' as in 'my hand', because personal information plays a constitutive role of who I am and can become" (Floridi 2016, p. 310).

From the point of view of these anthropo-eccentric philosophical underpinnings, "our dignity rests in being able to be the masters of our own journeys, and keep our identities and choices open" (ibid., p. 310). Any technology or policy that "tends to fix and mould such openness risks dehumanising us" (ibid., p. 310). Thus, "human dignity, understood in terms of polytropy, provides *the anthropo-eccentric ground for the right to privacy and individual control over our own constitutive formation*" (ibid., p. 310, italics added). Floridi claims that only this fifth philosophical anthropology or account of the grounds for human dignity can provide a robust enough interpretation of human value in modern times: only "within a philosophy of information that sees human nature as constituted by informational patterns do breaches of privacy have an ontological impact" (ibid., p. 311), i.e., do they affect the being of human (data) subjects.

All of this makes sense when it comes to adult human (data) subjects, but what about the *constitutive* data of *unborn* human (data) subjects? Are we to think also of their rights to privacy as being based on human dignity understood in terms of an "anthropo-eccentric" philosophical anthropology? And if so, why? To my knowledge, these questions have not been approached specifically in terms of the *privacy* concerns of unborn data before. Neither do the data of the unborn figure in the recent and promising way of thinking of ways of transcending the individual in privacy considerations, that of the so-called group privacy (Taylor et al. 2017). Within this approach, the current individualistic approach to privacy is questioned on the grounds that today many policies and decisions are "made on the basis of profiles and patterns and as such negatively or positively affect groups or categories," which is "why it has been suggested that the focus should be on group interests: whether the group flourishes, whether it can act autonomously, whether it is treated with dignity, etc." (ibid., p. 15). Currently, the group of privacy thinkers who think that "the focus on the individual, personal data, individual interests and informed consent or the individual control over data is too narrow and should be supplemented by an interpretation of privacy which takes account of broader data uses, interests and practices" (ibid., p. 15) is divided among those who prefer a view of groups as built up of discrete individuals and those who view group privacy as an "emergent property, over and above the collection of the privacies of the constitutive members" (ibid., p. 15).

However, what *has* been heavily investigated is the various ways in which the dignity of the living unborn human of flesh and blood has been negotiated in different societies around the world. Before looking into the question of how the privacy of the unborn data subject is based on dignity, we will thus first take a look at what has been said about the dignity of the unborn.

13.2.2 Sociological Perspectives on the Dignity of the Unborn

The so far most extensive review of how the dignity of the unborn has been conceptualized in various corners of the world is sociologist Deborah Lupton's book *The Social Worlds of the Unborn* (2013; Lupton 2015, 2017; see also Johnson 2014). In this book, Lupton takes as her starting point that the very "terminology that is adopted to refer to the products of human conception is inevitably politically, culturally and emotionally charged" (Lupton 2013, p. 6). Thus, when one speaks of "an unborn baby" rather than "a fetus," for instance, one is already taking a stance of the unborn entity being "already an infant, already a person." Here, I will follow Lupton's lead and let the term "unborn" stand for "any type of organism produced from the union of human gametes, whether *in vivo* (created in the female body) or *ex vivo* (created in the laboratory), whether it is destined to be an infant or not" (ibid., p. 6). This is not a simple or static category, however. Even with this encompassing definition, Lupton takes the unborn to be not a once and for all fixed thing but "constantly changing configurations produced by their interaction with a range

of heterogenous elements, human and non-human, ideational and material" (ibid., p. 7). Another word for such a constantly changing configuration is "assemblage," hence Lupton's use of the terms "unborn assemblage," "maternal assemblage," and "hybrid assemblage" to denote "the interrelationship between the unborn and the pregnant women who harbour many (but importantly, not all) of the unborn within their own bodies" (ibid., p. 7).

Historically, especially in the West, the nature of this hybrid assemblage has changed from the times roughly before the 1960s, in which "the unborn-maternal assemblage was inextricably interbound and considered as a unitary organism until the moment that the unborn passed out of the maternal body, at which point they were viewed and treated as separate entities" (Lupton 2013, p. 20), to the current strangely split dominant views of "the embryo" as either "already fully persons and already infants" meticulously studied by means of sophisticated medical technologies or "dehumanized therapeutic or research material" (ibid., p. 32). Ever since visualizing technologies enabled the unborn to be seen "*in utero* moving about, with recognizable features and limbs" (ibid., p. 22), the previous "haptic perceptions of the unborn" by the expecting mother have been "largely supplanted by optic or visual interpretations" (ibid., p. 22). This focus on the visually available traits of the unborn has also led to the fading out of the maternal body, which now tends to be viewed only as an "'environment' or even an 'incubator' for the nourishment and protection of the unborn" (ibid., p. 23).

These new possibilities for technological imaging of the liminal, strangely "Other" unborn have also opened up new ways of relating to them, from "somewhat repellent and unsettling and not quite (or yet) human" of some to the "already "lovable and cute 'babies'" of others, as amply evidenced in abortion debates (Lupton 2013, p. 16; Johnson 2014). In ways not possible before these imaging techniques, one can now "ontologically extend back infancy" into human developmental time frames, from the anti-abortion camp of "first moment of conception" to the provocative statement by bioethicists Alberto Giubilini and Francesca Minerva that abortion should also be possible "after birth" (ibid., p. 13). In practice, different social and cultural settings draw the line of the personhood of the unborn differently, based on different interpretations of when precisely the unborn can be considered to possess some kind of (from that point in time on) unnegotiable dignity of life. The decision-making scope of the maternal side of the unborn-maternal assemblage varies accordingly, both in terms of abortion and in terms of what the expecting mother can and cannot do while pregnant (smoking, drinking, taking drugs, etc.) (ibid., p. 73–74; p. 93–100).

However, the unborn figure not only in the formal laws of various countries specifying the exact starting point of subjective personhood. The blurring of the boundaries of the concepts of "the fetus" and "the infant" has been massively enhanced by the now routine practice of the ultrasound: "These images have therefore resulted in the 'social birth' of the new human to shift from the moment of physical separation from the maternal body at birth to earlier phases of unborn development, so that the bestowing of such social attributes as gender, personality and name often takes place before physical birth" (Lupton 2013, p. 35). This social birth of the new

human is also reflected in the practices of many pregnant mothers to share their ultrasound images on platforms such as Facebook, Flickr, Instagram, Twitter, and YouTube: "Indeed sharing the first ultrasound photograph on social media has become a rite of pregnancy for many women" (ibid., p. 42). Thus, these social media platforms provide "the technology by which private or commercial images of the unborn from a very early stage of development may be conveyed to a very large audience" (ibid., p. 43; for an extensive discussion on this; see also Johnson 2014, who has analyzed the ways in which such images of the unborn are distributed and used in various kinds of apps intended for expecting mothers and, to a lesser degree, fathers).

From the point of view of philosophical underpinnings, Lupton also enriches and diversifies the approach to the five alternatives presented by Floridi (2016). In addition to the major Western religions, she also makes reference to the way in which Australian aboriginal culture, Hinduism, Buddhism, the Chinese, and so on have envisioned the beginning of life and/or personhood as part of that life. However, from the point of view of philosophical underpinnings, the most important perspective is by far that of feminist scholars, who have "sought to counter the disappearance of the maternal subject and the focus of foetal rights over the pregnant woman by presenting a relational account of the unborn and maternal identity and embodiment" (Lupton 2013, p. 115). According to Lupton, however, her own view of the hybrid unborn-maternal assemblage as an always changing and ambiguous configuration as perceived by women themselves manages to successfully resolve these criticisms (ibid., p. 118).

13.3 What About the Constitutive Data of the Unborn?

What, then, about the rights to *privacy* of the unborn based on the always ambiguous and socioculturally varying foundations of unborn dignity? How does the sociologically sensitized reasoning of Lupton relate to the five alternatives presented by Floridi? Although not explicitly thematized by either Lupton or Floridi, their respective reasoning is of crucial significance for the kind of reflection on the privacy of the unborn that *has* taken place in the Western discussion, more specifically in one of the first reflective openings on the topic presented by Pormeister and Drożdżowski (2018). In a very recent article with the title "Protecting the Genetic Data of Unborn Children: A Critical Analysis," the authors note that although of central value from the point of view of the ever-increasing genetic data produced on the unborn, the topic has not been explicitly addressed in the major privacy event of the European Union, that of the GDPR, which entered into force in May, 2018. Here, the authors show how the lack of harmonized regulation in this matter leads to the diversity currently seen in Europe as far as unborn "data doubles" are concerned (Ruckenstein and Schüll 2017; Ruckenstein and Pantzar 2015). Some legislation gives more weight to the maternal side of the hybrid assemblage and some more to the unborn side.

However, the authors of this recent article claim that there are a number of dilemmas related to these varying solutions. For instance, placing weight on the maternal side and saying that the *constitutive* data of the *unborn* is a matter solely for maternal judgment creates an illogical situation after the birth of the unborn. Not only is the genetic data in question distinctly not the constitutive data of the parents, but also, as Pormeister and Drożdżowski point out, "the parents would then hold all rights to the genetic data of the born child, whilst the child itself would hold the same rights in terms of the same data" (since by being it born becomes a "data subject" in its own right, which it by definition cannot be before that; Pormeister and Drożdżowski 2018, p. 61). The solution to these illogical outcomes would be to make "the unborn child" the data subject provided that it is born alive; and this "should be done in the same manner as in the case of minors" (ibid., p. 62; see also Kurki and Pietrzykowski 2017).

Although creative from the point of view of the current unregulated situation, this solution is, however, problematic from the point of view of the reasoning of both Lupton and Floridi. First, as Lupton (2013) has shown, it is by no means neutral to speak of "the unborn *child.*" Speaking of "a child" here instead of "a fetus" already implies that the kind of "ontological extension" from the baby back to the unborn has taken place, with all its rich cultural connotations. Second, proceeding in this way as against the maternal side of the hybrid unborn-maternal assemblage already implies some sort of commitment to a philosophical anthropology (Floridi 2016) that does not make any distinctions between the first undifferentiated cell mass of preimplantation and a near full-term fetus. (See also Pormeister and Drożdżowski's definition of an "unborn child" as "a natural *person* before birth regardless of whether the person is born alive or not" (Pormeister and Drożdżowski 2018, p. 54, emphasis added)). This amounts to a very strong stance in terms of philosophical underpinnings.

Indeed, from the point of view of philosophical underpinnings, it would seem that Pormeister and Drożdżowski not only propagate an anthropo-*exclusionist* basis of human dignity (i.e., a view that separates human subjects from other entities in the world), but they also combine this strong stance with the *methodologically individualist* view that a group consists of discrete individuals. Each member of the group "unborn" is taken to be a clearly demarcated entity which already in the womb possesses all the properties of a "child." Thus, group privacy of the unborn is taken to be the sum of the privacies of all its constituent "unborn child" members. As we have seen, however, this is not the only way of arguing for extended measures to protect the privacy of the unborn. Such measures can equally well be based on the view of maternal-unborn assemblages (Lupton 2013) and on the view of group privacy as an *emergent property* of the group over and above the individual properties of its constituent*, always informationally vulnerable* members (Floridi 2016).

How, then, has the issue of the privacy protection of the category of the unborn been addressed in empirical cases where it already surfaces, for instance, in the context of the recently established Digital Maternity Clinic *Ipana Motherhood*? It is to this question that we now turn.

13.4 Case Exemplification: The Digital Maternity Clinic *Ipana Motherhood* in Finland

13.4.1 The Digital Maternity Clinic Ipana Motherhood: A Brief Description

The basic idea of *Ipana Motherhood*, piloted in 2013 and growing ever since in Finnish urban centers, is to provide a "versatile service package to support the times of pregnancy, birth and infancy" (https://www.ipana.fi/digineuvola; last accessed 1.2.2019). In addition to free professional advice and the innovation of the digital maternity card, the service provides its users with "the opportunity to buy additional services to ease your own everyday life." The service platform provides a Phone Clinic 24/7 as well as an opportunity to participate in a discussion forum consisting of both peers and health professionals. In the integrated service, the official health data of both the parent and the unborn and/or infant as recorded in the digital maternity card remains in the hands of health authorities, while the more unofficial data provided within the confines of the "Diary" remains under the control of the *Ipana Motherhood* account holder.

In this integrated platform, the user or account holder has full control over the privacy settings of the diary. As formulated by an interviewee:

> the consumer him- or herself owns the data, so we as a company cannot go and look at anyone's pictures or data. The mother owns… or the family owns them and manages them too… so we just provide the platform solution, so the family can for instance call people to their family portal… they can invite for instance grandparents, relatives, godparents… the close ones… so you can see for instance the foetus's growth rate, if the mother has shared it with this user group…so the mother is the main user there.

However, in accordance with the current ritual practice of the first ultrasound shared on social media, the platform also contains a possibility to link texts or images directly to Facebook (https://www.ipana.fi/aitiys/#/diary).

Reflecting this integrated solution, there are three official data registers: first, the platform company's customer register (Ipana Motherhood—CSAM Finland customer register, Extended Ipana Motherhood Service); second, the account holders' or mothers' register (Ipana Motherhood Service, Mother's Own Data); and third, the data register upheld by the health authorities (Ipana Äitiys Service, IT register). Although functionally a responsibility of the CSAM Finland, the third register is integrated with the basic solutions of the existing healthcare systems. In the second register, the following data can be recorded: fetal risk numbers, expected weight of the fetus, fetal movements, fetal measures, fetal structure, fetal heartbeat, SF measure, fetal investigations (such as chromosome tests), and whether the pregnant woman and/or mother has used or is using alcohol, tobacco, and drugs (https://www.ipana.fi/aitiys/tietosuojaseloste.html).

In accordance with the principle of the mother having full control over these data, this register explicitly states that as part of the aim of maintaining pregnancy health data, "the user may add her pregnancies and the data related to the service to

the extent that she sees fit." Also, the user "can utilize in the service also the data inserted by the health professional to the Maternity Card service and thereby fulfill her rights to access and inspect her own data by means of the service" (https://www.ipana.fi/aitiys/tietosuojaseloste.html). Finally, the principle of maternal control is further strengthened in the formulation that the aim of this register is to "keep and enable the inspection and use of the data that is owned by the user for the purposes defined by herself."

13.4.2 Assessment of Ipana Motherhood from the Point of View of the Central Analytical Concepts

From the point of view of hybrid maternal-unborn assemblages as described and operationalized by Lupton (2013), the Finnish legal context sides with other Western legislation that prioritizes the maternal side of the hybrid assemblage. In this, Finland resembles Estonia far more than Poland, the other country discussed by Pormeister and Drożdżowski (2018). In the name of self-determination, a mother has the right to decide about the continuation of the pregnancy until 12 weeks of gestational age and also a limited time after that depending on the medical assessment of the health of the fetus. This emphasis on the maternal side is reflected also in the Finnish perspective on unborn data. In accordance with the GDPR, personal data are linked to natural living persons, including live-born children. The emphasis on the maternal side of the assemblage is also reflected in the technical implementation of the *Ipana Motherhood* Service, which does not in any way distinguish between the data of the mother and the data of the unborn (https://www.ipana.fi/aitiys/tietosuojaseloste.html).

From the point of view of philosophical underpinnings, the Finnish context is thus very far from subscribing to the approach on the unborn as already "children" (either live or from the point of view of data). In explicit contrast to Pormeister and Drożdżowski (2018), who view unborn fetuses as not-yet-born children, and whose data should be protected from possible parental abuse from day 1 by stipulating that the prospective parent should act as a "legal representative of an unborn child in terms of data protection rights" (ibid., p. 62), the Finnish context takes the view that protecting the privacy of the unborn, viewed as an emergent property of the group rather than an individually prefixed property, is squarely a matter of parental discretion.

However, and importantly, this latter view would *not* seem to preclude case- and context-sensitive considerations pertaining to the protection of constitutive data of the unborn. For instance, it could well be suggested that despite the parents retaining full control over unborn data, they would still be required to pay special attention to the kind of data that define the unborn. In formal contexts, this could be included in considerations of, for example, disclosure of the results of genetic testing. In less formal contexts, such as the first visits to the maternity clinic, information

on the sensitivity of the topic could be provided to expecting mothers. Thus, should the EU legislative authorities decide that a harmonization of the legislation concerning the group or category of the unborn is in order, it is by no means necessary to proceed along the anthropo-exclusionist and methodologically individualist lines of Pormeister and Drożdżowski (2018). It is equally possible to proceed along the anthropo-eccentric and emergentist lines of Lupton (2013) and Floridi (2016).

Indeed, although the *Ipana Motherhood Service* lacks an explicit thematization of the subject, it could be argued that the topic is already indirectly recognized in the ways in which the *Ipana Motherhood* platform makes the visibility of unborn data a matter of the explicit public visibility deliberation of the mother or parent. Given the technical implementation of the platform itself, parents need to take an explicit deliberative stand as to who is going to see what unborn-related data, how and and where. Thus, although the service does not in any way restrict the informational agency of the maternal side of the unborn-maternal assemblage, it still does suggest that *some* of the unborn data is better shared only with some sort or extended family or "grandparents, relatives, godparents" (*Ipana* interviewee). In our view, this amounts to a technologically mediated standpoint on the privacy concerns of unborn data that acknowledges the sensitivity of the topic yet leaves the ultimate capacity to decide and act upon it firmly in the hands of the parent(s). In this, I suggest *Ipana Motherhood* reflects central insights from what Floridi (2016) has called an anthropo-eccentric take on the issue of human dignity.

13.5 Conclusions and Discussion

In alignment with the trend of digitalizing healthcare (Lupton 2014), the Finnish context has witnessed many projects and endeavors to this effect in recent years (see Pekkarinen et al., Chap. 14, in this volume). The *Ipana Motherhood* Service analyzed in this chapter forms part of this overall developmental trend. Although largely welcomed, the efforts at digitalizing healthcare have also met with criticism, not least from data activists and data social scientists worried about issues of control and management of especially highly sensitive personal data. The recent study of one such data activist initiative, the Finnish vision MyData, has brought to the fore not only the powerful ethos behind such strivings of ensuring adequate privacy standards—that of the autonomous human being in control of his and her digital affairs—but also the limits of that ethos. Human dignity, data social scientists warn, is always *also* a matter of collective processes and relations of common practices and ideals and values (Janasik-Honkela and Ruckenstein 2016; Lehtiniemi and Ruckenstein 2019).

In this chapter, I have thematized these different philosophical underpinnings of current perspectives on privacy and shown that the latter are powered by rather different views on the deepest foundations of human dignity. In light of this analysis,

our argument can be rephrased to be that the phenomenon of the *constitutive data of the unborn* shows us the limits of the currently very strong individual- and technology-centered take on privacy. In contrast to contexts in which such autonomous subjects can be identified, the case of the unborn points to the need for explicit, public, and collective deliberation around legitimate privacy-related practices and procedures.

As an empirical illustration, I analyzed and critically examined a recent suggestion to strengthen the privacy of the unborn and concluded that although it represents a welcome step in the right direction in the current unregulated situation, it still contains many assumptions that are highly problematic from the point of view of recent work in sociology and philosophy of information science. Not least among these is the "ontological extension" back from infants to the unborn as analyzed by Lupton (2013). I then contrasted this view with the one embodied in the *Ipana Motherhood* Service and showed that this is premised not on the anthropo-exclusionist and methodologically individualist view of Pormeister and Drożdżowski (2018), but rather on the anthropo-eccentric and emergentist view of Lupton (2013) and Floridi (2016). Finally, I showed technology developers have already integrated privacy concerns pertaining to the unborn in a way that encourages parents to be aware of such sensitive matters.

Although many of the reflections in this chapter might seem highly theoretical—for instance, the distinction between anthropo-exclusionist and anthropo-eccentric views of human dignity—the case of the data privacy of the unborn shows that the distinction is indeed crucial when deliberating about legitimate ways of dealing with unborn data. Are the unborn to be viewed as a category consisting of separate distinct "unborn children," whose privacy is to be respected in the same way as already born minors? Or are the unborn instead to be viewed as a category consisting of not children but "fetuses," the privacy of which group form "emergent property, over and above the collection of the privacies of the constitutive members" (Taylor et al. 2017)? Depending on which standpoint a given collective or community takes on these foundational matters, national legislations will display very different characteristics. Ultimately, I argue, this is a matter of *which kind of human-centric approach* we wish to support and advance. Indeed, from the point of view of the reflections in this chapter, the notion of "human-centric" is also far from unambiguous. A central future research task would thus be to investigate which kinds of interpretations of the notion of human-centric inform various kinds of data activist approaches. In this chapter, I hope to have provided a first step in this direction.

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Chapter 14
Elderly Care and Digital Services: Toward a Sustainable Sociotechnical Transition

Satu Pekkarinen, Helinä Melkas, and Mirva Hyypiä

Abstract The elderly care system's sustainability is one of the largest societal challenges of our time. Digitalization and the implementation of technologies in elderly care are viewed as offering possible solutions to the social and economic challenges of sustainability. This study's objective is to examine the development, implementation, and diffusion of technologies in elderly care from a sociotechnical perspective, leaning on the concepts of sociotechnical transitions. The focus mainly is on sustainable niche development, including interactions between niches and regimes in terms of sustainable sociotechnical transitions, how niches are developed in relation to sustainability, and in which conditions and circumstances promising niches can contribute to regime change in elderly care. Through a multiple-case study in different living environments of elderly residents in Finland, we identify factors that facilitate or hinder sustainable development and the implementation and diffusion of technologies in elderly care. The three case studies concern various types of development: introduction of tablet computers in senior housing, construction of a multisensory room in a care home, and the use of a care robot in care homes and in a rehabilitation hospital. Critical factors for sustainable niche development include involving users in the development processes, as well as simultaneous development of technologies and services. The multifaceted and effective use of technologies requires time and resources. Critical factors in niche-regime interaction are, for example, factors relating to attitudes, as well as technologies' maturity. The need to consider a wider perspective, rather than a singular disruption, is key.

Keywords Elderly care system · Sustainability · Digitalization · Sociotechnical transition · Finland · Multiple-case study

S. Pekkarinen (✉) · H. Melkas · M. Hyypiä
Lappeenranta-Lahti University of Technology LUT, Lahti, Finland
e-mail: satu.pekkarinen@lut.fi; helina.melkas@lut.fi; mirva.hyypia@lut.fi

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14.1 Introduction

This chapter considers the sociotechnical transition of elderly care services in Finland, focusing on elderly residents' living environments. Elderly care, as with other fields in society, has been affected strongly by digitalization and various technical devices and systems, such as information systems, e-services, service robots, and other technologies that assist physical and mental well-being (e.g., Östlund 2017; Siegel and Dorner 2017; Pekkarinen and Melkas 2017). Caring for an ageing population, which includes ensuring the elderly care system's sustainability – particularly sustainability's social and economic pillars – is one of the greatest societal challenges of our time. One possible solution is to use different technologies, but implementing them entails a range of challenges, including a lack of suitable technologies and immature existing ones. Adherence to rigid current practices and past development paths also makes the prospect of such changes problematic (Compagna and Kohlbacher 2015).

We examine the implementation and use of existing technologies from a sociotechnical perspective, leaning on the multilevel perspective on transitions (MLP) (e.g., Geels 2002, 2004, 2005, 2011; Geels and Schot 2007; Geels and Kemp 2007). In this frame, broader landscape changes, such as ageing of population, are perceived to interact dynamically with regimes, such as the present service system and emerging niche technologies and practices (e.g., Geels and Kemp 2007; Geels 2011; Pekkarinen and Melkas 2018). Our focus mainly is on sustainable niche development, as well as the interaction between niches and regimes in terms of sustainable sociotechnical transitions. We ask how niches are developed in relation to sustainability, and we ask under what conditions and circumstances promising niches can contribute to regime change. For example, we ask about the facilitators and barriers of change in elderly care. With the help of three case studies, we identify factors that facilitate or hinder sustainable development, implementation, and diffusion of technologies in elderly care. The study contributes to research on sustainable transitions and their complex dynamics as reflected in elderly care.

14.2 Sustainability of Elderly Care and the Role Technology Can Play

The sustainable provision of elderly care, mainly in relation to its quality and affordability, is a topic of debate in most welfare states (Essink 2012). The challenges of providing sustainable care with an ageing population and a shrinking workforce often are presented as being among the "wicked problems" of our time. *Wicked problems* are complex policy problems marked by uncertainty and a high interdependency among variables affecting them, as well as difficulty defining them in the first place (Rittel and Webber 1973; Bianchi 2015). Wicked problems cannot be solved within the boundaries of a single organization or specific administrative

level but are characterized by dynamic complexity involving multilevel, multi-actor, and multi-sectoral challenges (Bianchi 2015). In the case of societal ageing, this complexity is caused by diverging stakeholder views; uncertain future developments, such as increased life expectancy; and systemic complexity arising from the interplay among feedback mechanisms, accumulations, and delays within the system (Auping et al. 2015), e.g., how effective healthcare affects healthcare costs through increased life expectancy.

The concept of *sustainability* often is characterized as having three aspects: environmental, economic and social (Littig and Griessler 2005; Boström 2012) – with a cultural pillar sometimes included (Hawkes 2001). In this paper, our focus mainly is on sustainability's social and economic dimensions. Social sustainability is related to basic needs, e.g., happiness, safety, freedom, dignity, social responsibility, community development, and human rights (Vavik and Keitsch 2010). Under sustainable development, welfare is a right, not only for current citizens but also for future generations (Ródenas and Garcés 2017). In the context of healthcare and elderly care, sustainability is related to affordability, accessibility, acceptability, and quality (Toebes 1999; Grin and Broerse 2017a, b), as well as system adaptability (Fineberg 2012).

The concern about sustainability in elderly care arises from the increasing numbers of people in need of care services and, simultaneously, high turnover in the nursing and support staff ranks of elderly care services (Friedland 2004). A special concern expressed in the public debate – and part of the challenge's wickedness – has been how we can create sustainable systems to care for the ageing population in a way that achieves a balance between the economic and social requirements for sustainability without overemphasizing economic objectives. While the "Nordic welfare state" has its own distinct history (e.g., Melkas and Anker 1998), it faces the same debate, and ongoing initiatives and practical developments include attempts to seek solutions to the complex issues at hand.

In this study, the sustainability of elderly care is considered from the perspective of the implementation of technologies, as technology is expected to play an increasing role in meeting the anticipated sustainability gap in elderly care services (e.g., Kapadia et al. 2015; Malanowski 2008; Peine et al. 2015). However, the expectations for technology often are overemphasized. For instance, Neven (2015) and Peine et al. (2015) noted that gerontechnological innovations (those developed specifically for older people) often are embedded in a "triple-win narrative," in which policy makers, technology developers, and older citizens are said to benefit equally from scientific and technological innovations. Science, technology, and innovation are perceived widely to provide the means for solving the "grand challenge of demographic ageing" (Peine et al. 2015). However, users' involvement in the development of technologies is crucial here. If older technology users are given only a stereotypical identity as passive recipients and not viewed as active agents, it risks a triple loss instead of a triple gain: Older people do not get the technologies they need, companies fail to tap into the business opportunities derived from the ageing population, and government subsidies for gerontechnological

innovations result in prototypes and experiments that do not proliferate in society and become common (see also Peine et al. 2015).

14.3 Elderly Care in Terms of Sociotechnical Transition

In this chapter, the changes in elderly care and the role of technology in those changes are tackled in terms of sociotechnical transitions (Geels 2002; Geels and Schot 2007; see also Pekkarinen and Melkas 2018). Wicked problems, including ageing of population and its consequences for care services, typically cannot be tackled within one policy sector (Auping et al. 2015) or resolved with help from individual innovations. Instead, the solution involves systemic change, in which social and technical issues coevolve.

Sociotechnical transitions differ from technological transitions in that they include changes in user practices and institutional (e.g., regulatory and cultural) structures, in addition to the technological dimension (Markand et al. 2012). However, transition research mainly has focused on "material" sectors, such as transportation and housing (Ulli-Beer 2013; Kemp et al. 1998), as well as healthcare in a few studies (e.g., Kivisaari and Saranummi 2008; Kivisaari et al. 2013; Grin and Broerse 2017a, b). Our objective is to analyze how it can be applied to elderly care (e.g., Bugge et al. 2017).

The concept of sociotechnical transition stresses the interdependence of technological, social, cultural, and political dimensions, as well as the mutual adjustment of these dimensions (Smith et al. 2010; Bugge et al. 2017). The introduction of technologies into society and the development of technological innovations require a deep transition that entails the simultaneous development (coevolution) of technologies, service operations, and people's practices and mindsets (e.g., Geels 2002, 2005; Truffer and Coenen 2012). The ageing of the population and economic pressures in the public sector are among the macro-level changes that have contributed to the destabilization of the old "welfare state regime," acting as triggers for new innovative technologies and practices (Pekkarinen 2011; Bugge et al. 2017; Pekkarinen and Melkas 2018). In addition to digitalization and technological developments, they need to be viewed as co-contributors to the sociotechnical transition related to elderly care.

The multilevel perspective on transitions (e.g., Geels 2002, 2004, 2005, 2011; Geels and Schot 2007; Geels and Kemp 2007) is a concept that tackles changes in the aforementioned way, viewing transitions as coevolutionary processes occurring at three interrelated conceptual levels: the sociotechnical landscape, sociotechnical regime, and bottom-level niche innovations. In this framework, system changes occur through these levels' interplay, as illustrated in Fig. 14.1.

Changes at the landscape level include, for example, macroeconomic changes, deep cultural patterns, and macro-political developments. They exert pressure on the meso-level, the sociotechnical regime, and may make it unstable (Geels and Schot 2007). The sociotechnical regime includes markets, user preferences,

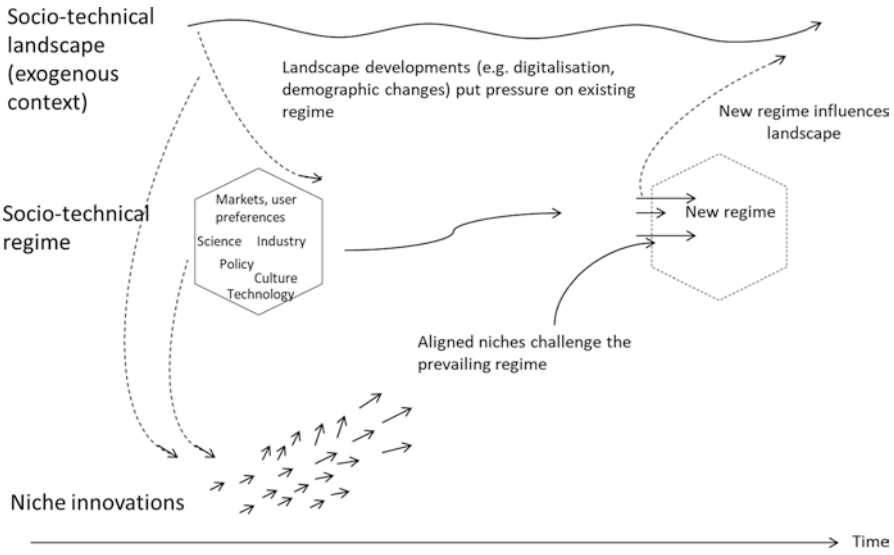

Fig. 14.1 Multilevel perspective on transitions. (Modified from Geels 2002; Geels and Schot 2007)

regulations and laws, scientific understanding, and political and cultural climates. It also includes technology and infrastructure aimed at fulfilling single societal functions (Geels 2005), such as elderly care. The *sociotechnical regime* refers to the rule systems that guide and orient the activities of social groups, including scientists, users, policy makers, and other actors, who interact and form networks with mutual dependencies (Kemp et al. 1998; Geels 2005; Geels and Kemp 2007, p. 442). Applied to the context of elderly care, the elderly care regime comprises people's preferences as related to the products and services that they use and consume and the market and public sector's responses to those wishes and requirements. It also comprises the elderly care industry, infrastructure and service structures, products (using both high and low technology), and current ways of producing services.

Niche innovations, i.e., radical novelties, form the MLP's micro-level. Niche innovations are emerging social or technical innovations that differ radically from the products and practices in the prevailing sociotechnical system and regime. They can gain a foothold with particular applications, in various geographical areas or with the help of targeted policy support (Kemp et al. 1998; Geels 2018). These radical innovations surface either in response to landscape changes or in a bottom-up fashion. When landscape changes destabilize the current regime, it creates a window of opportunity for these radical novelties. This is why niche innovations are called "seeds for change" (Geels 2005).

Uncertainty characterizes niches, as innovative practices have not yet resulted in best practices, rules, and routines. Niche innovations that are supported by more actors and receive greater resources have higher degrees of momentum (Geels 2012). System transformation occurs when niches gather sufficient momentum so

that these relatively loose configurations become institutionalized and create capacity, allowing emerging technologies and practices to challenge and re-institutionalize the regime (Bugge et al. 2017). Examples of niches in healthcare and elderly care include service robots, various monitoring devices, technology for self-diagnosis, and novel service configurations or care work practices. These novel service configurations and practices may include empowering and activating methods for the elderly, and promising examples exist of a remarkably decreased need for long-term inpatient care and medication based on them (Finne-Soveri et al. 2014).

The role of niches is important in sociotechnical transitions, as examined in extant strategic niche management (SNM) literature (Kemp et al. 1998; Schot and Geels 2008). Related concepts describing niche-regime interaction include upscaling, linking, sociotechnological translation, and niche-regime translation (Smith 2007). Also, the concepts of societal embedding (Kivisaari et al. 2004) and niche anchoring (Elzen et al. 2012) provide highly similar content. Niche development is a necessary, but insufficient, precondition for a regime shift (Berkhout et al. 2011). The mechanisms through which niches contribute to regime reconfigurations are not yet clear (Bui et al. 2016), and a need exists for greater in-depth insight into how niches interact with regimes (Smink et al. 2015). However, in addition to actual niche development, niche-regime interaction is a key process in a transition because new rules and practices are integrated into the regime through it (Bui et al. 2016). The selection of new technologies and innovative practices is more than mere adoption. Users also must integrate novelties into their practices, organizations, and routines (Geels 2002), and niches frequently collide with the regime because of existing practices' inertia and lock-ins.

Geels (2018) emphasizes that the focus of transition studies should be shifted from "singular disruption" to "multiple innovations" and "system reconfiguration" (Markand and Truffer 2006). The analysis should be broadened from niche innovations toward a better understanding of alignment with regime developments, including degrees of lock-in, tensions, destabilization, and incumbent reorientation. Incumbent actors can resist, delay, or derail transitions, but they also can accelerate them if they orient their strategies and resources toward the niche innovation (Geels 2018). Geels encourages the study of niche-regime interactions bi-directionally, viewing them as multidimensional struggles between niche innovations and existing regimes. These struggles include economic competition between old and new technologies; business struggles between new entrants and incumbents; political struggles over adjustments in regulations, standards, subsidies, and taxes; discursive struggles over problem framing and social acceptance; and struggles between new user practices and mainstream ones. Besides sociopolitical and discursive dimensions, the techno-economic and business dimensions also should be addressed in niche-regime interactions (Geels 2018).

14.4 Empirical Context: Regime Description and Upcoming Niches

14.4.1 Elderly Care in Finland

Social and healthcare services' operational environment is experiencing changes in many societies. According to Oborn and Barrett (2016), two contemporary trends have the potential to reshape health system delivery significantly in the coming decade. The first is digital health and big data science, and the second is increasing patient and citizen engagement. These trends are related strongly to increasing citizen responsibility, co-production of information, usage and mastery of one's own health data, and digitalization of (self-)services. These trends also will play a major role in ongoing social and healthcare reforms in Finland, where the structure of social and healthcare services will be revamped over the next few years.

In Finland, social and healthcare services traditionally have been the public sector's responsibility, mainly that of municipalities. Currently, financial resources for social and healthcare services come from various sources, from which they are channeled to service agencies via different providers. The principal resource providers for healthcare services include central and local governments, the Social Insurance Institution of Finland, households, employers, wage earners, and private insurance companies. Social services mainly are financed by the central government, local governments, and clients themselves (Regional Government, Health and Social Service Reform 2018).

Within the planned reforms, existing multisource financing of social and healthcare services will be simplified, and users will be given greater freedom of choice. The responsibility for providing public social and healthcare services will be assigned to autonomous regions that are larger than municipalities. The public sector's role will change, as the reforms aim for private and nongovernmental sectors eventually to increase services provided. According to policy goals that the present government has formulated, the objective is to reduce health and well-being gaps, safeguard the equal provision of social and healthcare services throughout the country, and create preconditions for reducing the economic sustainability gap by managing costs (Regional Government, Health and Social Service Reform 2018).

14.4.2 Digitalization and Upcoming (Technological) Niches in Elderly Care

As in many other countries, digitalization plays a major role in social and healthcare reforms in Finland. The government has adopted strategies for implementing digitalization of government and public services, as well as introducing related ICT

operations in social and healthcare services and local governments. The objective is to support both users and professionals via efficient information systems and new e-services. Services are produced in a new manner that optimizes service processes with the help of digital tools. The e-services' objective is to help citizens maintain their well-being and health (Regional Government, Health and Social Service Reform 2018). However, concerns have arisen regarding citizens having equal opportunities for access to digital services, as well as new demands and requirements for care professionals' changing work tasks, such as online chats and service advisor roles, stimulating critical discussion (Hyppönen and Ilmarinen 2016).

Overall, high hopes have been placed on digitalization and gerontechnological innovations, such as e-health, various types of monitoring, home automation, robotics, and other simpler applications (Pekkarinen and Melkas 2017). E-health and health information technology traditionally have supported patients by providing better access to records, integrated diagnostics, and information searches, but nowadays, patients can engage with their health and other care services in new ways, e.g., through social media. In doing so, patients and service users also are creating new forms of data, evidence, knowledge, and support, which can offer value to various stakeholders (Oborn and Barrett 2016). However, a research gap exists on how to handle this area at the strategic level. Thus, in addition to hardware (different kinds of assistive technologies), software (information systems), and combinations of the two, digitalization includes human factors and practices as an important element.

14.5 Methods

14.5.1 Multiple-Case Study

Our study was based on three case studies, all conducted in Finland and characterized by various types of technology in different living environments with elderly people. These technologies were used with the intention of finding innovative and sustainable solutions that would benefit the elderly, as well as their caregivers. The case studies entailed the following: (1) implementing tablet computers in senior housing; (2) construction of a multisensory room in a care home; and (3) the use of a care robot in care homes and a rehabilitation hospital. By considering the perspectives of management, care professionals, and elderly end users in these case studies, we identified several critical factors in sustainable implementation and use (related to affordability, accessibility, acceptability, quality, and adaptability) (Toebes 1999; Grin and Broerse 2017a, b; Fineberg 2012) of technologies for elderly care and in the scalability of these technologies.

A multiple-case study was used as the principal method in our empirical examination. In this approach, a contemporary phenomenon is investigated in-depth within its real-life context (Yin 2009). In case study research, data collection typically is extensive and draws on multiple sources of information (Creswell 2007).

The empirical data for this study include data collected via sessions, workshops, and surveys and written material that the case organizations produced. Additionally, in case study 3, semi-structured focus group and individual interviews were conducted. The semi-structured interview themes were formulated based on theoretical knowledge and observational evidence from the implementation period.

In the following passages, the three case studies are described in greater detail:

(1) Implementing Tablet Computers in Senior Housing

Case study 1 focused on the construction phase of a new "smart house" (a block of flats) and the technological solutions contained in it. A particular novelty was the introduction of tablet computers, provided for each apartment in the new building. The clients were involved in the development process, e.g., in workshops, where their needs and expectations for their living environment and technology therein were mapped out. These needs and expectations included promoting a sense of community and the use of mainstream technologies in addition to "pure" assistive technologies. Based on these needs, the organization decided to purchase ordinary tablet computers for each apartment in the newly built house (Fig. 14.2). Students from a local vocational educational institution provided instruction on the use of the tablets. A communication channel (app) was installed on the tablets, but otherwise, they could be used as ordinary tablets. The new house was equipped with other technologies (smart elevator, automatic lighting, video entry phones, well-being wristbands, etc.) as well, but these were not the focus of this study.

(2) Construction of a Multisensory Room in a Care Home

Case study 2 focused on the development phase of a multisensory room, a physical area that was designed as an area for relaxation. The room can be arranged to

Fig. 14.2 The new smart house and a tablet computer. (Photos: Satu Pekkarinen)

Fig. 14.3 Multisensory room showing the tablet and activities. (Photos: Päivi Ahonen, Mirva Hyypiä & Satu Pekkarinen)

provide a multisensory or single-sensory experience by adapting the lighting, atmosphere, sounds, photos, scents, and textures to each ageing person's specific needs at the time of use. Mobile technology was integrated into the room through a 55-inch Android tablet. The primary purpose was to create a comfortable environment (Fig. 14.3) in which elderly people can relax or enjoy pleasant activities. In the future, when the experience of enjoying the room and its services becomes more commonplace, the objective might include reducing elderly people's medication consumption. The development process was conducted in collaboration with technology providers, designers, care professionals, elderly people, and the researchers.

(3) Use of a Care Robot in Care Homes and a Rehabilitation Hospital

Case study 3 focused on the implementation phase of a care robot named Zora, a 57-centimeter-tall humanoid robot (Fig. 14.4) that can be used for rehabilitation and recreation. It is operated through a tablet or another computer, and it has sensors, a speech synthesizer, microphone, camera, and speakers. The robot features human-like characteristics: It walks, moves its hands while speaking, and blinks its eyes. It is pre-programmed to perform several functions, but it also is possible to program the robot with the help of visual icons on the interface. No technical programming skills are required to use it.

Fig. 14.4 Zora. (Photo: Satu Pekkarinen)

During the implementation period, the robot was used for rehabilitation in two care homes and in a geriatric hospital. The robot either was introduced to the clients in a special session, or it played a part in routine group activities (exercise or literature groups) organized for the clients. In the care homes, a group of two to four physiotherapy or nursing students operated the robot, and in the hospital, a physiotherapist or nurse operated it. The robot facilitated exercises, played music, told stories, performed dances, and played interactive memory and guessing games with elderly clients (see also Chap. 10).

14.5.2 Data Collection and Analysis

Regarding data collection, a case study requires the use of multiple sources of evidence and often is used to contribute to our knowledge of individual, group, organizational, social, and related phenomena. Having multiple sources of data helps address the issue of construct validity because multiple measurements of the same object are provided (Yin 2009). Construct validity is guaranteed through the triangulation of multiple sources of evidence, chains of evidence, and participant checking (Yin 2003; Yazan 2015).

The data from case studies 1 and 2 were collected during two organizations' development processes in 2015–2017: the Lahti Foundation of Housing and Services for the Elderly in the Päijänne Tavastia region in Southern Finland (case study 1) and the Service Centre Foundation of Lappeenranta in South-Eastern Finland (case study 2) (Table 14.1). Both of these nonprofit organizations provide housing and other services for elderly people, and they are future-oriented and interested in utilizing technology in developing their services. The data were collected through

Table 14.1 Case study descriptions

Case study	Case study experiments	Main target group	Data collection and participants
1. Tablet computers 	Construction of a new "smart house" for elderly people; special focus on providing tablet computers in the apartments as a communal communication channel.	Ageing people living independently	Three workshops: technology in the living environment in general (21 elderly clients and four members from personnel)
	The development work was conducted together with the technology providers, designers, care professionals, elderly residents, and researchers		Four workshops: orientation to the use of tablets (19 elderly clients and 1 care professional, as well as 5–6 students providing guidance in tablet use)
			Survey for clients (April–May 2017): 29 females and 12 males aged 60–90
2. Multisensory room 	Development of a multisensory environment, especially for clients with memory diseases.	Dementia care clients and care professionals	Three workshops and two seminars among care professionals (3–10 care professionals per event)
	The development process included technology providers, designers, care professionals, elderly people, and researchers		Three benchmarking visits and briefings with collaborating companies (company representatives, director, and two managers and researchers)
			An audiovisual workshop via Skype in a collaboration between case studies 1 and 2 (4 care professionals, one researcher, and 22 clients from case studies 1 and 2)
			Survey for participants in a testing session (April 2017); with feedback from 35 respondents, including care professionals, visitors, and students

(continued)

Table 14.1 (continued)

Case study	Case study experiments	Main target group	Data collection and participants
3. Care robot 	Introduction of a service robot in public elderly care services in care homes and a geriatric rehabilitation hospital.	Elderly people/ clients in a geriatric rehabilitation hospital and in care homes that provide around-the-clock care services	Participatory observations of the robot being used for rehabilitation purposes at two 24-hour service care homes and at a geriatric rehabilitation hospital (27 activity sessions)
	Finding appropriate ways to use it and orient personnel toward its use		Focus group interviews with the care professionals (35 people), individual interviews with three members of management, and group interviews with 5 clients and 6 healthcare students

participatory observation, including comprehensive notes and photos taken during the workshops and meetings. In case study 1, inhabitants' experiences with tablets also were collected via a survey between April and May 2017. Healthcare personnel distributed the written survey forms to each apartment. In case study 2, students from Saimaa University of Applied Sciences helped the case company organize an additional testing session in the multisensory room for care personnel, visiting senior citizens, and fellow students. The session was organized in April 2017, and participants' feedback was collected through a written survey at the end of the session. In addition, an audiovisual workshop via Skype, in a collaboration between cases 1 and 2, was organized in February 2017. Four care professionals, a researcher, and 22 residents from Lahti and Lappeenranta participated in the Skype workshop. In all three case studies, the researchers were not mere observers but also participated in the sessions and workshops as planners, participants, or facilitators. Their participatory positions within the study naturally influenced the way that data were interpreted, but the authors' roles within the cases varied, e.g., they took part simultaneously or separately in the sessions and workshops as developers or facilitators. Different roles in a multiple-case study enable researchers to view the case studies from various perspectives and explore differences within and between cases.

The data for case study 3 were collected in a field study conducted within municipal elderly care services in Finland between December 2015 and April 2016 (Table 14.1). During this period, the care robot Zora was introduced into elderly care services in the City of Lahti in Southern Finland. Data were collected during a 10-week test period, when the robot was introduced into the elderly care environment. Researchers observed the activity sessions (Fig. 14.5), each of which lasted about an hour, during which comprehensive notes and photos were taken. The researchers also observed care professionals' sessions, during which they planned the

Fig. 14.5 The robot in action during an exercise session. (Photo: Satu Pekkarinen)

implementation phase and received training on how to use the robot. The topics of the semi-structured interviews with the care professionals, managers, and healthcare students included primary reactions and experiences during the implementation and familiarization phases. They also included anticipated and experienced benefits and challenges, impacts on work practices, and perceptions concerning the robot's suitability and applicability in aiding elderly inhabitants or care work. Interviews with five clients focused on their thoughts when they first saw the robot, e.g., its pleasant, surprising, or irritating characteristics; differences in recreation sessions with or without the robot; and their willingness to participate in sessions with robots in the future.

The research was conducted using ethical standards to avoid any harm to participants. Both care personnel and clients consented to participate in the sessions and research. Leaving a session before it ended was permitted. Care professionals assisted clients, for instance, if any had mobility problems. Client safety was ensured by using technologies only under the appropriate and competent supervision of at least one care worker. The tablet computers were an exception to this rule, as the clients had them in their own homes. However, in this situation as well, intensive support was given. The research material was anonymized, and no personal or health-related information could be identified from the data. Health-related information about clients was neither sought nor obtained.

Content analysis was used to analyze the data. The analysis was based on occurrences of mutual themes, contradictory feedback, experiences, and suggestions for improvements, with specific attention paid to issues related to sustainability (social and economic aspects) in technology implementation. The researchers analyzed all the data, both independently and collectively. In addition, the data were discussed with the participants from the case organizations at various meetings related to the projects.

14.6 Results

The selected case studies represented niches in which technologies were applied in ways that were responsive to the challenges brought by landscape-level changes in elderly care. In the following section, critical factors in the niche development of the selected case studies are identified, and the conditions for their scalability in terms of niche-regime interaction are examined.

14.6.1 Case Study 1

14.6.1.1 Niche Development

Case study 1's objective was to introduce tablet computers into senior housing for use as a communication channel and also to familiarize older people with new technologies, thereby preventing a sense of digital exclusion. As pieces of technology, tablet computers may be considered mainstream, but providing them to all inhabitants in a block of senior flats, then using them as a communication channel, can be considered a niche.

The experiences from this case study showed that considering that the end users were elderly inhabitants, critical success points are adequate support for and meaningful content of this technology, e.g., relating the use of the tablet to personal interests and hobbies. Resources for learning (both technological and time) need to be provided. In this particular case, these issues were considered carefully, and the participants mostly felt that they had received sufficient support for their tablet use.

Another critical point in the case's success was the openness of the participating personnel: prejudices and stereotypical views related to ageing people's learning skills should be questioned. This does not mean that the possible restrictions that accompany ageing should be overlooked, i.e., they need to be considered. According to a survey among inhabitants, 91% of the respondents thought that having a tablet was a good thing (Pekkarinen et al. 2017). Residents who were nearly 90 years old learned how to use these tablet computers, raising interest in other kinds of technology as well (Pekkarinen et al. 2017). In the development of a niche innovation, user participation and related learning are crucial. Learning to use a tablet can be a social process that includes interacting with peers. Supporting this kind of social practice was considered important in this case. This highlights the fact that technology use should be tied in with different kinds of practices. In addition to technological skills, the users also need cultural skills relating to the practices. Using social media is an illustrative example. Data protection needs to be learned, too. Implementing technologies while simultaneously developing services is challenging for management. Generally, management plays a vital role in how services and technologies are enabled to function together.

14.6.1.2 Niche-Regime Interaction

If tablet computers in senior housing are to be diffused and scaled up into a regime practice, questions about resources for purchasing the technology and for providing the necessary support should be addressed. The positive experiences from this implementation case have raised interest among regime actors, especially because of its societal impacts in narrowing the digital divide between generations. However, questions about resources remain: Who should pay for tablets for the elderly, and who should provide the introductions and orientations needed? Stereotypical views also persist regarding elderly people's needs and abilities. It is still common for elderly people (or care institutions) to be offered only different kinds of assistive technologies, which have a very different and considerably higher price structure than mainstream technologies. However, as this case shows, many elderly people also are capable of using mainstream technologies and benefitting from them, with no need for special and expensive solutions.

14.6.2 Case Study 2

14.6.2.1 Niche Development

Case study 2's objective was to develop a multisensory room for a dementia unit and provide a relaxing and calming atmosphere for inhabitants by adapting the lighting, atmosphere, sounds, photos, scents, and textures to the specific needs of the particular ageing person using it. The biggest challenge in this niche development was related to finding suitable technologies for this holistic concept. These had to be collected from different sources, and the various technologies had to be combined and used differently from how they were used in their original context.

The crucial challenge here was related to the ability to combine and coordinate the collaborators' diverse forms of knowledge and expertise. In addition, many of the technology providers did not have any prior experience with elderly care. Furthermore, a challenge was to coordinate the different experts in the network (working in different organizations), as well as enable them to understand and collaborate toward a common objective.

As in case study 1, management played an important role. The managers needed to be committed and present during the development process. The personnel had a chance to purchase various pieces of equipment and the necessary expertise during the development process, but this required that management give them permission to invest in these facilities. Case study 2 also showed that the more the equipment, solutions, and elements are combined, as happened in the development of the multisensory room, the more knowledge and skills the users are required to have.

This applied both to the development process and to the use of end results. When assessing suitable technologies and designing their possible combinations, a multi-faceted understanding, which included both knowledge and skills, was needed. The

multi-technology development process required in setting up the multisensory room could be viewed as a small "laboratory" of technology design processes, which typically suffer from coordination challenges and shortcomings in finding suitable combinations. Therefore, the lessons learned will be valuable in future scaling-up.

14.6.2.2 Niche-Regime Interaction

Referring to the aforementioned observations, at least two types of diffusion and scaling-up seem to be needed. First, there is a need to view the older person's well-being and quality of life from a holistic perspective and in a proactive manner. Second, the need exists to contribute to building meaningful wholes from various technological "bits and pieces." As in case study 1, these worthy objectives may be thwarted by difficulties in finding resources for purchasing the technology. Support is needed to make it possible to use the technologies smoothly, but even more important is the objective of building meaningful wholes from disparate technologies. These two types of diffusion can contribute to sustainability, but they would require longer-term understanding and support, which usually create a bottleneck at all levels of decision-making.

Longer-term understanding also is needed to overcome possible collisions with current regime practices. One of the multisensory room's long-term objectives, with its calming effect, is the possibility of elderly residents reducing their medication doses. However, medication supply is also a business, so some current regime actors might not support such reductions. Wherever such conflicts of interest exist, they should be made visible and the basic objectives of humane care highlighted.

14.6.3 Case Study 3

14.6.3.1 Niche Development

The principal objective of this case was to introduce a care robot, Zora, into municipal elderly care services for use in rehabilitation and recreation (see also Chap. 10). Another objective was to find new purposes for how the robot could be used in elderly care. During the implementation phase, two attitudes toward the robot were noted: For some of the care professionals, the robot was perceived as a useful tool, contributing to clients' well-being and activity and providing new perspectives and content on their work. Some care professionals were enthusiastic about having a new "workmate" and were willing to act as the principal operators of the robot in their work communities, including giving up their free time to become acquainted with the robot. Conversely, for other employees, having the robot in the work environment represented the possibility of risk, even danger, leading to their withdrawal from the implementation. Some employees felt that the robot was just a waste of money and created additional work when their workday already was too busy.

Moreover, concerns surfaced about the time used and the commitment from the whole working community and how being occupied with using the robot would detract from "true" care work. These attitudes led to tensions and controversies in the work communities. The care professionals also raised ethical concerns. Some even felt that the "childish" robot was degrading to the elderly.

However, the clients usually welcomed the robot with joy, and these positive responses and the interest from elderly clients affected care personnel's attitudes positively. It was noted that after having personal experiences working with the robot, staff attitudes turned in a more positive direction. One nurse said: "At first, I had a few negative feelings, but when I saw the joy of the clients, it changed my attitude." According to a physiotherapist, "Robot use requires supervisors and work, but do we depart from what we give to clients? I cannot tolerate technology, but still, I have a positive attitude if I see that the customer gains something good out of it. You have to reach beyond your own attitude."

Regarding management, sufficient planning is needed, and time should be allocated for using a robot in work communities. The robot must not cause undue extra work for caregivers, so this needs to be planned carefully. Also, plenty of prejudices and fears regarding robots remain. Such anxieties must be taken seriously, but they can be smoothed out, e.g., through effective orientation (Pekkarinen and Hennala 2016). It is more likely that robots will be accepted as part of a "care regime" with each new pilot program and more experience gained.

It was found that an "interpreter" was needed to help the robot and clients understand each other, requiring new skills from personnel. On balance, the multifaceted and effective use of a robot requires time and resources, although basic functions can be learned quickly. This is a central finding in relation to sustainability. One of the interpreter's tasks was that she or he needed to bring transparency to usage situations, such as clarifying who was talking when the robot was talking and how the robot functioned. Furthermore, various technical issues need to be addressed: a good Internet connection is needed; the robot's voice can be too quiet for older people to hear; and the robot may not hear what the older people say, may misunderstand their dialects, etc.

14.6.3.2 Niche-Regime Interaction

Several issues were noted during this niche experiment that relate to the present regime. As noted during the implementation phase, attitudes toward robotics in elderly care vary: Robots are viewed as both opportunities and threats. These attitudes are related, for instance, to quality of care, ethical issues, and work division between human beings and robots (Tuisku et al. 2017). Attitude polarization exists at both the niche and regime levels.

The nursing and physiotherapy students who operated the robot and were responsible for planning the robot's interactive exercises and activities with elderly residents considered the task very interesting. They were interested in technological opportunities in care, but they mentioned that technology had not played a significant

role in their education or in the curriculum. The use and design of the robot required that existing personnel develop new skills. Therefore, such issues should be considered, both in the education of future professionals and in the continuous education or short-term training of current professionals. In addition, developing technological skills in care-related education probably would contribute to the diffusion and scaling-up of these technologies. The multidisciplinary nature of such education and training also would be valuable. In case study 3, the importing company provided the training on how to operate the robot, but its representatives were physiotherapists, not engineers. Such cross-disciplinary competencies are likely to be valued increasingly in the working life of the future, which also requires new practices in education.

Apart from people's attitudes and managerial issues, what hinders robot implementation and regime change most is the technologies' immaturity (e.g., Hennala et al. 2017). The robot's technological development process lies beyond the scope of this chapter, but it has been stressed in extant literature that users – in this case, older people, their caregivers, and care managers – should be involved in the process to overcome some of the aforementioned shortcomings (e.g., Peine et al. 2015).

14.6.4 Summary of Results: Critical Issues in Niche Development and Implementation and Niche-Regime Interaction

The results of the three case studies are summarized in Table 14.2.

14.7 Conclusions and Discussion

Moving toward a transition in elderly care services is a systemic issue. In this chapter, we spotlighted the case studies' sustainability aspects, as well as the conditions in which niche innovations can develop and diffuse to challenge the prevailing regime. Increasingly, sustainable elderly care requires that attention be paid to (1) niche development practices, co-creation, agile development, and coevolution of technologies and services in niches and (2) niche-regime interactions so that individual best practices can become mainstream practices to scale up and contribute to regime transformation. What does this entail, i.e., what hinders or facilitates implementation of relevant technologies? General issues were introduced in the results, but they need to be acknowledged in different ways through individual technology-related design and use processes, with attention paid to users, care professionals, managers, and policy makers. Already in 2009, Raappana and Melkas have said that it is time to start lobbying for a holistic view of technology use in elderly care, as otherwise rapid technological change could lead to increasingly fragmented

Table 14.2 Critical issues in sustainable implementation and diffusion of technologies in elderly care, on the basis of the three case studies

Niche development and implementation: elderly end users	Niche development and implementation: care professionals	Niche development and implementation: managers in care facilities	Niche development and implementation: technological/ infrastructure-related perspectives	Scalability/ niche-regime interaction
Willingness and motivation	Attitudes toward technologies in care, e.g., fear of robots replacing nurses	Skills and expertise: information about new technologies	Utilization of mainstream technologies in addition to "pure" assistive technologies	Considering the heterogeneity of the elderly and seeing quality of life and well-being in old age in a holistic manner
Time, effort, and support, also from the families	Explaining the technology used with clients (transparency)	Networking skills in development projects and in purchasing processes	Knowledge about contexts/user groups, with tailoring of technologies according to user groups	Support for purchasing processes
Encounters via personal interests	Proper training and time allocation made for learning	Ability to combine and coordinate diverse forms and expertise of collaborators	Availability of technologies/ facilities	Funding models (the question of costs on a larger scale)
Need for knowledge about various practices and cultures related to technology use	Ability to use the technologies and facilities	Ability to meet and understand clients and care professionals' different views and needs related to technology	Compatibility of different technologies and dependence on external resources, such as Internet connection providers	Attitudes toward technologies in care (especially robots)

(continued)

Table 14.2 (continued)

Niche development and implementation: elderly end users	Niche development and implementation: care professionals	Niche development and implementation: managers in care facilities	Niche development and implementation: technological/ infrastructure-related perspectives	Scalability/ niche-regime interaction
Critical issues also depend on the "phase" of old age (e.g., health condition) and family circumstances	Support in use	Provision of time for learning and support	Support for finding appropriate combinations of technologies	Understanding of the whole of technology (mainstream technologies, specific care technologies, even non-digital assistive technologies) and their possible combinations
			Development and maintenance of technologies is expensive (despite high prices, technologies may still be in progress)	Inclusion of technology in education for care, as well as other educational reforms
			The possibility of tailoring technologies to customers' needs and only paying for the properties that one needs	Integration of users into technology development
			Questions of maintenance and support: Are those guaranteed?	

solutions that drift further and further apart from each other. A major change in direction is needed, as the past 10 years have not seen much improvement, with good practices remaining isolated from each other.

Our case studies demonstrate that the sustainability of elderly care and the implementation of technology are systemic challenges. The role of technology in the sustainability of care seems to be somewhat ambivalent, and in this sense, it is part of the challenge's wickedness. For instance, related to the quality and acceptability aspects of social sustainability, fears exist that the use of technology reduces the human touch in care and is not part of the "true essence" of care work. However, on the other hand, the use of technology may increase peer contacts, as well as care contacts, if technology helps care personnel in those routine-like tasks that are not social in nature and, for instance, reduce the need to move from one place to another. Thus, it is a question of good division of work between a human and technology.

Even though the need for change in elderly care is recognized, several critical issues can either hinder or facilitate implementation of relevant technologies. These issues often are related to lock-ins in existing practices, while the practices would need to change simultaneously with the implementation of new technologies, which requires allocation of time, as well as new skills and expertise for elderly users, care professionals, and managers. Thus, the question is not merely about technological expertise but also about the willingness to create new practices, as well as reconsider certain prejudices regarding the elderly's capabilities.

The starting point for systemic development is very different if the new technologies can be combined with existing infrastructures and practices or whether the process must start from scratch. The risk of collisions and a need for compromise always exist – often at the expense of usability issues – when too many preconditions must be considered in the planning process. Wherever it is possible to develop a new technology and a new service concept without preconditions, it is far easier to develop a technology and service that support each other right from the start.

Attitudes toward technology in elderly care work are divided: Both enthusiasm and fears are common, with the role of technologies in the field of care still undefined in many ways. The potential remains for sustainable care if usage is well-planned. Where technology is included in the management of sustainable elderly care, it is crucial that the technology's objectives are clear and that care personnel and clients all acknowledge these objectives. Time must be allotted for learning, and the implementation of technologies in elderly care requires a rethinking of services and work practices. It is an issue that should involve the whole community. Orientation is a major issue that needs to be highlighted and dealt with skillfully in this process. Services for the ageing population may benefit from technology, but smart and sustainable use of technology requires planning and human resources. Sustainability must be approached from the perspective of its four aspects: social, economic, cultural, and environmental.

The transition related to ageing should be viewed from a wider perspective, not just in terms of social and healthcare, but from a life-based perspective. Old age is a long period with different stages and orientations (Laslett 1989; Gilleard and Higgs 2002). Östlund et al. (2015) also noted this, emphasizing that as technology

users, older people often are viewed stereotypically or approached in the context of assumptions and static identities. Sustainable solutions need to adapt to the reality that many older people are comfortable using technology. Sustainable ageing depends on participating in preventive activities during the whole lifespan, which includes participation in society. An example of lifespan thinking and preventive strategies is the Finnish guidance center system for families with babies and small children. It was established in the 1950s, and the first infant clients are now reaching retirement age. In sustainable care, the perspective always should cover one's entire lifespan while understanding the concerns of holistic well-being, not just focusing on "repair work" at a certain age. If such thinking were linked to technologies, we might find the correct track at the societal level. Technology that supports intermediary housing models and adaptable lifespan living would be a practical example.

To help promising niches become aligned and to increase their momentum during the transition, niche actors should aim to learn more systematically from previous experiments. It is not always necessary to use a completely new technology, as older technologies can be utilized in new and innovative ways and in new areas, as our results from case studies 1 and 2 indicate. Furthermore, simple solutions may prove to be the best way to achieve sustainability. This also would support the environmental aspect. When novel technologies, such as robots, are involved, both similar and different requirements concerning attitudes, competencies, and the technology's maturity exist. Combining and skillfully using both older and newer technologies relate to what Geels (2018) highlighted when he spoke of the need to consider a wider perspective, rather than a singular disruption. Some of the multidimensional struggles between niche innovations and existing regimes have been presented in this chapter. Future research should aim to cover, for instance, the techno-economic and business dimensions through in-depth case studies.

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Chapter 15
The Cinderella Story: Employees Reaching for New Agency in the Digital Era

Eveliina Saari, Sari Käpykangas, and Mervi Hasu

Abstract The chapter analyzes how backstage service employees may rise from invisibility to active agency when they are at risk of losing their jobs during the digitalization of services. We conducted an intervention process aimed at envisioning future digital services and new work. The analysis is based on employee interviews regarding their future work horizons, interviews of management and HRD, and two workshops organized to support the co-creation of future service and work. The approach derives from the literature on human agency. Invisible backstage service workers may face a similar developmental pattern to that of "Cinderella" when finding their way in the digital era. The interviews of the managers and HRD indicate how difficult it is to foresee and develop the future competencies of employees, before deciding upon the path on how to organize the service between human beings and technology. The study contributes to the understanding of backstage service employee's perspectives and makes visible their attempts to have an agency in technological transition, which previous studies have rarely analyzed in depth.

Keywords Agency · Digital service · Automation · Transformation · Implementation · Backstage · Employee · Health care

15.1 Introduction

> In the fairy tale of Cinderella, a girl is exploited as a servant by her family but enabled by a fairy godmother to attend a royal ball. She meets and captivates Prince Charming but has to flee at midnight, leaving the prince to identify her by the glass slipper that she leaves behind.

E. Saari (✉) · S. Käpykangas
Finnish Institute of Occupational Health, Helsinki, Finland
e-mail: eveliina.saari@ttl.fi; sari.kapykangas@ttl.fi

M. Hasu
University of Oslo, Oslo, Norway
e-mail: m.a.hasu@iped.uio.no

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Digitalization embraces almost every aspect of contemporary work and ranges from local care services to highly specialized cloud services. Thus, the contents and arrangements of work also change in concert with digital development. New types of business start-ups, entrepreneurship, and flexible forms of work have moved toward each other. The insecurities in societal and economic developments have given rise to new forms of employment, with a need for increased flexibility on the part of both employers and employees. The characterization and theorization of the forms of new work and new employment are still very much in progress (e.g., Frey and Osborne 2013; Brynjolfsson and McAfee 2014).

The occupation-based approach of Frey and Osborne (2013) estimates that as much as 47% of all people employed in the USA will be replaced by computers and algorithms within the next 10–20 years. However, this estimation has been criticized for using occupations as a unit of classification and for overestimating the development speed of implementing new technologies. A job's task-based approach has been proposed as being more realistic. Automation usually aims to automate certain tasks rather than whole occupations, and bundles of tasks that cannot be easily automated always exist. A task-based approach to automatability in the 21 OECD countries estimates that only 9% of jobs are potentially automatable (Arntz et al. 2016). Our study contributes to the current debate on this subject by focusing on the task-based impacts of new technology. Both approaches mentioned above point out that the risk of job automation exists mainly among low educated workers and identify a need for upskilling and training these people. However, they neglect to analyze the potential attempts, agency, or motivation of these workers to either create new jobs or move on in their careers, which we discuss in the chapter.

The current process of transition into the digital era is radically changing the service context in our societies. For clients, services become ubiquitous, constantly available, smart, and globally reachable. This new service context is not only changing client experience; it also has a profound influence on how frontline and backstage work is organized (Ostrom et al. 2015). Research on the digitalization of services has mainly been concerned with increased productivity and the changing role of the customer (Brynjolfsson and Hitt 2000; Breit and Salomon 2015). Analyses of the changes in the content of service work in the digitalized environment have so far been scarce. However, the exploratory study of Åkesson and Edvardsson (2008) has identified a demand for expanding expertise and new professional roles among employees to make them actors in complex IT-enabled service systems.

The introduction of new technology can have significant effects on the work lives and careers of employees, not only by replacing manual, face-to-face service work but also by offering them new developmental horizons (Stam et al. 2006). Our research questions are as follows: (1) What kinds of change horizons the service workers identify in their work in a moment before its automatization? (2) How do they voice their own job roles and skills in the future work in an arena including both employees and managers? (3) How does the managers and human resource managers foresee who should be responsible of developing employees' skills for the future? Should organizations support employees' agency and help them develop

their skills for the future work, as in the fairy tale of Cinderella the fairy godmother intervenes in routinized everyday life before the royal ball?

This study highlights the workplace- and task-level consequences and opportunities of digitalization in an internal support service unit of a Finnish health-care organization. The case study is focused on a word processing service, in other words typists' jobs, in a moment before the majority of their work tasks may be automated. The chapter contributes to the employee-driven and human-centered perspective (e.g., Høyrup et al. 2012) in the digitalizing care service context. The chapter is structured as follows. Following this introduction, the previous research and agency as a guiding concept for the study are presented. The empirical context and methods are then described, and this is followed by the findings according to the three research questions. The chapter concludes with a summary of main findings and a discussion of their practical implications and presents the limitations and possible future research avenues.

15.2 Agency of Employees in Transition

In the complex, digitalized service environment, the frontline employee's role, which represents dyadic client-employee interactions, is in transition. As IT-enabled innovations turn clients into operators of their own services, the diminishing role of employees is reinforced (Rust and Huang 2014). For the individual worker, building a new work role and crafting a new job in the rapidly changing labor market is not an easy task. In this paper, we use agency as a theoretical concept to explore the emergent motivational state of employees, in their intentions and attempts to "scout" for new competence, responsibility, and role/relations at work. Agency can be seen as human potential to establish and pursue different projects in life (Archer 2000). It includes forming interests in society, as well as having the resources and capabilities to pursue goals through interaction with other people (Archer 2003). The relational view of agency emphasizes the interconnected nature of peoples' lives; people need each other's support and resources when navigating the social world, and the relations between them influence their choices and possibilities (e.g., Donati and Archer 2015). Changes in agency can be traced in (transformational) speech, discussions, and interactive (work) situations, as employees discursively and habitually use and perform previously unused voices or actions (e.g., Halford and Leonard 2005).

However, as the face-to-face servant role of service employees may seemingly fade away when the technological interface pushes them into back offices, these employees may be given the opportunity and space to form new agencies and adopt new roles and relations. They may become innovators of new services based on their deep experience with clients; enablers, helping and training clients to use technology; differentiators, giving a genuinely empathetic and personal face to the surface of the service; or coordinators, handling integration and building bridges between different offerings (Bowen 2016).

In at least the implementation phase of e-services, service workers' agency may depend on how quickly and smoothly customers are willing to adopt the role of co-producer of the service and be guided to increase the use of self-service with the IT system (Breit and Salomon 2015; Berger et al. 2016). Previous studies of e-government have perceived increases in staff workload because the staff must simultaneously assist citizens in digital communication and guarantee face-to-face service to the most vulnerable citizens who have neither the competence nor possibility to use digital services (Berger et al. 2016)

Employee-driven perspectives on innovation have recently been widely discussed (e.g., Høyrup et al. 2012). However, research and intervention efforts have scarcely focused on how, in practice, frontline employees may become service innovators or designers of their own work (Hasu et al. 2011; Saari et al. 2015). Workplace-level intervention methods and tools to enhance employee innovation, and especially the process and outcome assessment of interventions, have scarcely been reported (Nielsen 2013; also Watanabe et al. 2015). Case studies so far indicate that empowering and allowing employees to apply their customer know-how and ideas to service innovation increases preconditions for development, improves services, and positively influences their well-being (Hasu et al. 2014; Honkaniemi et al. 2015).

Only a few studies have captured workers' positions, experiences, and subjectivities anchored in place, space, and time (Halford and Leonard 2005) in the implementation process of a new technology. One sensitive, ethnographic analysis of a nurse and a doctor who implemented the use of the neuromagnetometer (MEG) in the clinical activities of a hospital laboratory uncovers the story of an employee who was both an insider and an outsider, struggling with the unfinished software and working as an invisible actor for the developers (Hasu 2005; Star 1991). In the ethnographic interviews, Doctor Sara indicated she was a step ahead of the technology developers in concretizing the emerging measurement service for patients. However, several continuous problems in the use of the software program, and not being taken seriously, finally made her resign from the task (Hasu 2000). This shows how unofficial and fragile the agency of the employee might be during the technological implementation process. Social service professionals' resistance to mobile reporting has been seen as contradicting their primary motivation, which is to help their clients. If the new technology takes too much time away from interaction with clients, and if it is experienced as disturbing the ability to operate autonomously, employees tend to resist it (Stam et al. 2006). Unfortunately, IT systems and mobile applications designed to employees appear to be more cumbersome inside organizations than they appear to the clients.

Mobile technology has been considered a means to control and make employees objects of managers' surveillance in, for example, home care work (Vuokko 2008). This contains the risk of losing the autonomy of individual work situations and may seriously jeopardize employee motivation, particularly if reporting to managers by using unfinished technology takes more time than time spent in the customer encounters.

Previous research on the implementation of e-services in the public sector has identified several points which will change work and the relationship between

employees and customers. These concern service encounters, customers as co-creators, efficiency, and increased complexity and integration of services (Åkesson and Edvardsson 2008). Being available 24/7 through e-facilities increases the pressure on employees, because customers constantly demand solutions to their problems via numerous channels. Although face-to-face meetings may decrease, employees may still lack time to help customers who either cannot or do not want to use e-services. As customers become co-creators or conductors of self-services, they gain more responsibility for how they use the services, how much they comprehend and take advantage of them. Efficiency depends not only on the IT skills of customers but also on the willingness and interest of individual employees to learn to use them. Sometimes employees are not informed early enough about IT updates or changes in service regulations, and customers may demand them even if the employees do not yet know how to provide them. The flow of information across authorities has become easier because of IT systems and through single e-identification of customer. However, the rules of collaboration between organizations may lag behind (Åkesson and Edvardsson 2008).

These studies raise important questions as to why the implementation of a new technology is such a subtle process and emphasize that the employee's agency is much more complex than anticipated by the management and IT service providers. They also show a clear need to analyze how not only frontline employees but also backstage workers could be more involved in anticipating and designing their new work when part of their work is being digitalized.

15.3 Medical Documentation Service as a Case

Our case context is the largest specialized medical care organization in Finland, more specifically, one of its subunits, which is responsible for various internal support services for hospitals operating under the organization. The particular service unit in question provides word processing services for the entire hospital district (five hospitals) and employs 300 typists who type approximately two million medical texts per year, dictated by almost 3000 medical doctors and other clinical personnel. The word processing of medical texts is an integral part of medical records and documentation in specialized care.

A new medical documentation service for doctors who perform medical dictation as part of their patient work was about to be implemented, when we entered the case organization. During 2016, after the manual dictation process, which used several hundreds of specialized typists located in hospital clinics (decentralized process), was replaced by a more digitalized and integrated process (centralized "typing factory"), which also includes the opportunity to work from home, the number of typists decreased considerably. Currently, the digitalization of medical documentation is intensifying in the organization, through the adoption of speech recognition technology (Rabiner and Juang 2008), which aims to make doctors the users of the

system and will eventually reduce typist work, and consequently the number of typists, to a minimum.

In the health-care sector, speech recognition can be technically implemented at either the front-end or back-end of the medical documentation process. Front-end speech recognition is when the provider (doctor) dictates into a speech recognition engine, the recognized words are displayed as they are spoken, and the dictator (doctor) is responsible for editing and signing off on the document. Back-end or deferred speech recognition is when the provider (doctor) dictates into a digital dictation system, the voice is routed through a speech recognition machine, and the recognized draft document is routed along with the original voice file to the editor (typist/doctor), who edits the draft and finalizes the report. Deferred speech recognition is currently widely used in the industry.

At the time of our study, neither typists nor medical personnel were familiar with speech recognition technology. Of the 18 doctors interviewed in a case study, only one had used speech recognition during a test project in 2014. Attitudes toward the system among doctors were heterogeneous, partly negative but partly also positive. The image of front-end speech recognition dominated. Doctors did not know the different ways to apply the automated system. Positive future expectations included increased time saving and improved patient care and documentation quality. From the viewpoint of medical work and documentation, the most important future benefits that the doctors anticipated were wireless/mobile work, multi-location work/work without a standard office, fast operations, full digitalization (no paper documents), just-in-time work, patient-centeredness, and simplicity. However, what seemed to be unclear to all stakeholders was the question of how to differentiate and categorize different user groups and how many types of process variations should be offered.[1]

15.4 Methods and Analysis

Ethnographic and intervention approaches were chosen as the methodology to help understand in a fine-tuned and sensitive way the perspectives of both employees and managers during a period when a challenging change was about to take place in a service process (Hammersley and Atkinson 1983; Hasu 2005). The challenge of the sensitive ethnography of change in the methodological sense is to be able to trace something that has no clear material or social patterns yet; it is something which is about to emerge (Hasu 2005). The study was conducted in 2015–2018, as part of a research project called "The revolution of service economy – Human being at the core of digitalization," funded by Business Finland and the participating

[1] The case study on medical doctors' interviews was part of our research collaboration with a third party (Kaufmann Agency), initiated by the researchers. The interviews included sample of medical doctors from different medical departments of the hospital, the future users of the speech recognition system.

organizations. It enabled us to conduct several interviews of multiple actors, follow the change actions and aspirations in the organization, and carry out an intervention process that was designed to support the learning of the participants. The intervention method aimed at learning in the value networks has been reported in detail in another paper (Saari and Hasu 2015). Here we focus on one particular element: what the grassroots-level employees gained from the facilitated workshop discussions.

First, by interviewing the typists themselves, we analyzed how their transformative agency is emerging. The data consisted of four individual typist's interviews and two group interviews, in which five typists participated. All of these interviews, in which all together nine typists were involved, took place before the intervention (workshops) in their own workplace environment, and their purpose was to explore how the typists saw their current work and its future. All the interviews were audio-recorded and transcribed. The interviewers also wrote an interview memo and added their immediate reflections on it. In the interviews, the typists were asked to predict the future horizons for manual transcription work from the employee's perspective, when automatic voice recognition was about to replace routine manual work.

We identified the alternative horizons of the typists through content analysis of the entire interview data. The special focus of the analysis was on what motivates the interviewees in their work and how they foresee their future work. Interviews were also used for informing employees of the design of the intervention workshops, in which they, managers and other involved stakeholders, would together construct a vision of future services and work.

Second, the researchers organized a human-centered co-evaluation process consisting of four consequent workshops. They were not part of organization's routine human resource development activity but could be defined as experimental research interventions. We voice-recorded all the groupwork discussions of each workshop, and for this chapter, we chose data from the first two workshops. Their tasks were to (1) construct a shared vision of the future and (2) create an inspiring story of one's future work and expertise when the service had been digitized. Six typists (who were previously interviewed) and three supervisors from the support service unit participated in the group discussions of the two workshops. In the first workshop, employees and managers worked in the same group, and in the second workshop, they worked in separate groups. Each group was supported by a researcher (second author), a facilitator between different groups (the first author), and a person (one or two) from the steering group of the project, who was called metaphorically as a godmother or a godfather.

We analyzed the workshop discussions in which the typists were asked to create an inspiring story of their future work, when their current service had become to a large extent digitized. We analyzed the discussions of two voice-recorded and partly video-recorded workshops. Group discussions and presentations of the workshops were transcribed, and samples of them were chosen after being read through several times in order to identify employees' speech turns. We analyzed the two workshops as an ethnographic narrative, which resembled, in a metaphorical sense, the developmental pattern of the Cinderella story. The narrative interprets the significant intervening roles and the consequences of the employees' discursive actions and

speech turns during the workshops. We present excerpts from the presentations of the group work as samples of output from the intervention.

Third, we analyzed the perspectives of the management. We interviewed four management representatives and two HR professionals from the organization, on how they foresaw the need for preparing the staff for technological changes in the word processing services. All these interviews were also audio-recorded and transcribed, and an interview memo with reflections was written.

15.5 Findings

In the following four sections, we present the empirical findings in detail according to the research questions. The subsections illuminate employees' agency in three complementary ways (Donati and Archer 2015): (1) as it manifested in the individual and group interviews as an individual orientation to the future; (2) as it manifested as a relational phenomenon in two workshops, in which employees and supervisors were together pondering the future of the service and typists' work; and (3) how the HRD and managers were prepared to empower employees' agency for creating new competence in a moment before the typists' work tasks were at stake to be automated.

Section 15.5.1 examines what kinds of change horizons the service workers identify in their work in a moment before its automatization. The results of the analysis indicate the hidden potential and agency of the backstage workers. They are motivated to design alternative futures for their work, if they are allowed to be involved in designing them. We identified four different developmental horizons from the interviews indicating agency of typists themselves. Sections 15.5.2 and 15.5.3 examine how the employees voice their own job roles and skills in the future work in an arena including both employees and managers. The workshop discussions and their consequences indicated that if the typists were given subtle support, they could rise from a humble workers' role into designers of their own jobs. Finally, Sect 15.5.4 reports how the managers and human resource managers foresee who should be responsible of developing employees' skills for the future. The perspectives of the managers and HRD opened up the complexity and systemic nature of the change and the way in which this hinders the preparation for developing new skills on the employee level.

15.5.1 Employees' Change Horizons

The analysis (in Table 15.1) outlines four different developmental horizons interpreted from the employees' conceptions. These are (1) quality control editor, (2) ICT bridge-builder, (3) clinically oriented worker, and (4) efficient homeworker.

Table 15.1 Typists' motivation and developmental horizons reflecting their agency

Typist type	Motivation	Change horizon
Quality control editor	Ambitious in terms of quality and rapidity of the service	Eager to learn and take part in speech recognition projects, expects editing work to be a positive and more accountable alternative to typing
	Appreciates independent work without interruptions	
ICT bridge-builder	Has good ICT skills and pays attention to complaints about user-friendliness, likes independent work, but is happy to guide others as well	May become a lead user or trainer of speech recognition system to peers and doctors
Clinically oriented worker	Is interested in the contents of the dictations, wants to learn more about medical details, feels to be a part in the care process	May potentially discover new work between doctors and the patients, interested in specializing in medical glossary, humanization of current typing factory
Efficient homeworker	Thinks that mobile working is well combined with hobbies or family life. Virtual connections with peers are not a problem	Ergonomics and security could be improved as could social support at work

These developmental scenarios are not mutually exclusive and may even be realized simultaneously, depending on how the digitalization of the service proceeds.

Quality control editor and ICT bridge-builder appear to be clear, obvious job horizons, if speech recognition technology replaces mechanical typing work. Becoming a clinically oriented worker and finding a new role in the care value chain would probably require exploration of the clinical work processes at hospitals and expertise in health care. The efficient homeworker represents the current organization of the typists' work, in which digitalization has enabled working from home. This may also be the future, if the typists become editors. It should be noted that we are not speculating on how many jobs may disappear after speech recognition technology is implemented. These job horizons were defined by the typists themselves, reflecting their own agency (see Archer 2000). As a whole, it is interesting how the employees themselves could foresee their own future work horizons, when most of the job tasks were at stake to be automated. It is worth noting that those typists who were working at the office and were more involved in the development of word processing services could define their future work tasks as part of the organization more easily than those who were teleworking from their homes. Our other study among typists who worked full-time at home revealed that motives for taking care of future career within the organization were less central. Balancing work with the family life and individual entrepreneurial activities or hobbies were found important in their future horizons (Hasu et al. 2018).

15.5.2 Toward a Shared Vision

The aim of the first workshop in January 2016 was to construct a shared vision for the future service process. For inspiration, the researchers provided the group with the beginning of a sentence and asked them to continue, for example, "In 2025, when you dictate your patient information as a medical doctor…."

The researchers also provided four scenarios of the future typist's work, constructed from the interviews to be further worked on.

In the first workshop, the group was heterogeneous. Six typists, three supervisors and three persons from other involved organizations, from the steering group of the research project (called godmothers or godfathers), supported the discussions, with two researchers either facilitating or observing. It is worth noting that it is not very common for basic-level workers such as typists to be invited to take part in organization or innovation development projects as participants in workshops. The group was obviously too big to include all the participants in the discussion. The discussion began by considering whose point of view they should focus on. Two young male typists, called John and Hans (pseudonyms), began to lead the discussion, while all the other typists mainly listened without intervening. The supervisors were silent in the first half of the discussion; however, they became active when there was pressure to determine the results.

The topic chosen was how the work of the medical doctor (MD) will change when the speech recognition system becomes a mundane tool. The group figured that the MD would have more time for patients. The typists raised a practical procedure for consideration: Will the MD record the patient data himself into the different systems in the future?

> Hans: "So as we've discussed, dictaphones have been in use, and secretaries used to type speeches. So previously, it was a straightforward process, in which the MD dictated and someone typed it onto paper. Nowadays, there are so many ICT systems, and they integrate in so many different ways that MDs have to learn by heart what codes to use in order to transfer the data to the right places at the right time, so if the MD could…"
> Godmother: "How has it changed?"
> Hans: "…just concentrating on care work and then explaining it, without having to bother about how the system processes the information."
> John: "We face the problem that you mentioned, and which is a fact, that it is the MD who is finally responsible for it. This cannot ever be outsourced for any reason, but it still makes it a kind of small bottleneck in the process."

The workshop discussion hardly dealt with the future work of typists at all. The observer tried to remind participants of it:

> Researcher: "What's going to happen to the employee, to the typist?"
> John: "That was thrown away."

This comment referred either to the inspiration card that was supposed to stimulate thoughts on the future typist's work or that this work would disappear as a job. A supervisor raised the patient perspective very strongly: "…in 10 years' time, everything will work from the patient's perspective. The patient will enter their information into the systems or have body measurements taken, and the data will

shift automatically into the systems." This was an ambitious and futuristic vision. The discussion shifted to the patient experience. A typist again raised the point from his own experience for discussion. Patients do not usually understand MDs' language, as he described:

> Hans: "When the personal data of the patients are entered into the database, is it available for the patients as well? Or do we need a feedback system that allows you to ask extra information? I've asked many friends after they've visited a doctor – what did he say? The reply is: I don't know."
> Godmother: "Or he doesn't remember."
> Hans: "They speak such a different language."
> John: "Exactly."
> Hans: "Can the patient consult virtually, or by email, that my patient data says this, can I get some extra information?"

Interestingly, the typist recognized another bottleneck, which presents an opportunity for new work in the form of giving advice.

The godmother and the godfather constantly promoted the discussion by questioning or supporting comments, such as:

> Godfather: "In this phase, do we really want to get rid of typist work? Whose task is this streamlining? Do we focus on it as MD work or assistant work?"
> ---
> Godmother: "When you said that the doctors speak a language that the patients don't understand. It's a challenge. How does digitalization help then, in order to make it clear?"
> ---
> Godmother: "Help each other, please help now."

When the facilitators pushed participants to compress the perspective into one single vision, the group figured out a concept of effectiveness. The first vision they formed was: "Digitalization as a tool to make care more effective." A typist added: "and a better relationship between doctor and patient." The concept of digitalization as a formulation bothered many, so finally, after a godfather's intervening speech, the vision turned into: "Open patient data improves the care relationship and the effectiveness of care." Hans, who wrote the vision, was chosen to make a pitch speech for this. The typist was clearly nervous but somehow assertive when it was his turn to make the speech in public.

> Hans's oral presentation: "The Medical Doctor does not use his time to dictate previous cases, but only dictate fresh research findings, the care plan and, for example, the admission note to x-ray. And speech recognition shows the text on the computer screen as fast as he dictates it. He corrects a few words that the machine has misheard. The text then shifts to our unit, where a careful office worker takes care that the information is put in the right places. The MD is likely to have left some sentence open to misinterpretation or double meaning and makes a note of this: that could you please clarify. It is not delayed though, although it is noted and will be checked."

The pitch speech was a convincing, customer-oriented description, describing how the patient gets better treatment and enjoys a better care relationship when he is himself responsible for entering his own patient data into the system. What was surprising in the speech was that a new role emerged for the typist, as a kind of quality inspector, without having been formulated in the previous discussion. The supervisors were keen to listen to the speech and did not feel the need to add a single word.

15.5.3 A Story of the Future Typist in Action

The aim of the second workshop, organized in March 2016, was to accelerate the future service experiments that were chosen after the first workshop. The main task was to envision and construct a story which concretizes the experiment and actualizes the future vision and in which the workers and service users take on their future roles. The researchers provided two tools: (1) a profile template to fill in, concerning the description of the anticipated worker profile of a typical worker and a typical user, and 2) a story template, in which employees were asked to write the beginning, the solution (middle), and the grand finale of the story. This time the typists were put into their own group in order to be able to deepen their understanding of their future work. The group consisted of four male typists and one female typist, a researcher, a godmother, and a godfather.

At the beginning of the conversation, the employees mentioned that typists had no educational requirements for their job at present. As the problem for the story, they chose a situation in which the speech recognition system misinterpreted the amount of a drug in a prescription. The group began to discuss whether the editor could correct the mistake without bothering the doctor. This would require both increasing employees' responsibility and increasing their knowledge regarding medicine, as the following excerpt shows:

> Typist 1: "What should I write? Speech recognition has misinterpreted the speech of the MD, and the patient has been prescribed the wrong medicine. Something like that."
> Godmother: "The system simply made a mistake. But then, this is the problem, but how it is solved?"
> Typist 1: "Let's assume that the editor [typist] discovers the mistake. The patient doesn't know the proper dosage."
> John: "It's the editor's task to notice it."
> Godmother: "Our task was to think about your role in the situation."
> John: "The editor's task is to notice the mistake."
> Godmother: "The editor discovers the mistake, and what does he do then?"
> Typist 2: "We should be given more responsibility."
> John: "So, should we extend the editor's responsibilities, just like that? What would this involve?"
> Typist 2: "Currently in some units, typists are allowed to correct a bit."
> Typist 1: "Oh, do they have official authorization?"
> Typist 2: "Small mistakes may be corrected in some places."
> Typist 1: "I'd like to correct or add too, when I'm very sure about it, but I can't, I'm not allowed to."
> Typist 2: "There are different practices."
> Godmother: "In our case, we should think about the pros and cons."
> Typist 2: "If our knowledge increases, then responsibility can too."

The conversation indicated that in some contexts, typists were allowed to correct minor factual mistakes, but usually the MDs had to check each ambiguity themselves. Obviously, this slows down the flow of information to the patient. The godmother constantly asked questions to promote the discussion but also gave the participants space for working out solutions. In the discussion, peer support was recognized as important in order to gain good-quality texts.

During the workshop, a young female typist, Sandra, silently wrote down new areas of expertise into the worker profile description template. She volunteered when we asked for story presenters. John and Sandra presented the story together to the other groups as portrayed in Fig. 15.1. Sandra started to depict a future multi-skilled employee:

> "We would like to introduce you to an employee, Mikael West, 43 years old man. His title is editor or quality controller. We had different scenarios on what kind of work he would do in the future. In terms of education, we thought that in the future, recruitment straight from college may no longer be valid. He has theoretical education in quality control or nursing. Not in the sense that he would be able to drill a skull, but he is aware of what this entails. His duties include quality control, fixing mistakes, and he is perhaps specialized in some areas of medical expertise. He doesn't deal with all special sectors but examines, for example, neurosurgery dictations. Collaboration with his colleagues is of course intense."
>
> And about his motivation: "He has a long work history at the hospital. He started as a typist but has now become an editor. He has some basic illnesses himself, so he may identify with the role of the patient. And this is the reason he aims for as perfect a result as possible. In the services he appreciates IT system that learn from mistakes, so that an MD may teach the program himself. For example, if a foreign doctor does not articulate very clearly, the speech recognition program repairs it a bit and the text appears, saving the editor's time. Mikael is content, as he can avoid straining his hands, as he does not have to type everything, but only modify work here and there…"

Then John described the actions of the editor. The culmination of the story was that the editor was authorized to correct a mistake that required medical expertise.

> John's oral presentation: "I don't need to bother Doctor Pekka. He can continue playing golf. We have a trained editor who can immediately say that this is up the spout (there's a clear mistake). He can check the original dictation and find that the speech recognition system has misinterpreted it and that it should be something else. He can correct it himself, without bothering anyone else. He can probably consult his colleagues on the case (waving

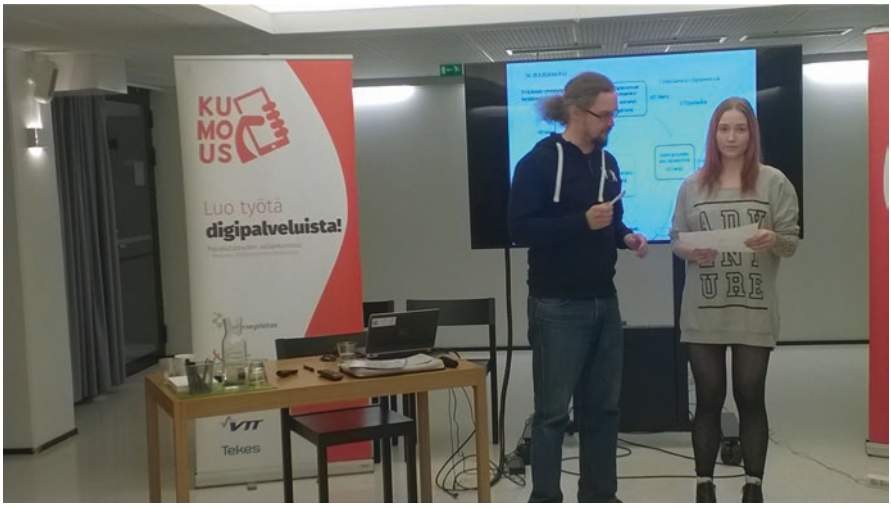

Fig. 15.1 John and Sandra, typists, presenting future editors' expertise and actions

> his hands back and forth) and ask for help. And the case is very quickly taken care of without having to bother the doctor. If there is a bigger problem, he consults the doctor. Such relatively trivial cases, which of course are not trivial to the patients, but trivial in terms of using time, can be solved in this same utopia in a jiffy." (The audience gave a big round of applause)

The analysis of the workshops demonstrated how subtle intervention and outsider discussants (in this case a godmother or a godfather) may play a significant role in encouraging usually invisible workers to innovate. The empirical analysis highlighted the relational nature of agency (Donati and Archer 2015). Low educated workers may not feel justified in participating and contributing to the design of the future services and new job tasks, if they are not invited to the development projects by their supervisors. The full potential of workers may not become visible if they are not encouraged to use their personal voices. The story also revealed how anticipating the way in which a future worker would act, makes borders of the different professions and their job descriptions visible and questionable.

15.5.4 How to Prepare for the e-Documentation and Future Skills of Employees

The aim of the interviews of the management representatives and HRD was to understand the overall vision of the specialized medical care organization and its relation to its in-house support service unit. Furthermore, it was important to understand whether the organization took the "high road" or "low road" (Boud et al. 2006) in how they saw investments in learning and creating new skills among their employees if backstage work in its present form appeared to be at risk.

15.5.4.1 Managers as Leaders of the Change

The top management's vision of the entire specialized medical care seemed to prioritize cost-efficiency as the main motive for technological change, as described by one top manager:

> Our strategy and priority is e-service, e-Healthcare. This means that in practice, all the functions that are applicable will be transformed into a virtual reality in which a human being may get help for his problems, as an active agent. …The precondition for this is that we are able to change these practices in a way that everything that can be done without human hands is made without human hands. Because, ultimately 60% of our costs goes to human salaries, and the traditional way in which patients are called to the hospital to hear laboratory results has come to an end. (Manager, MD, 15)

One of the development managers, however, pointed out that the impact of e-services should be examined on a longer time scale if we are to understand what kinds of savings they produce and how. This statement reflects a more doubtful view of digitalization.

The manager of the support service unit explained that the future service concept in medical documentation may be based on either front-end or back-end speech recognition. Radiologists who had already used speech recognition technology, and dictated only short implications, argued strongly for the front-end concept, but the support service unit also had to consider all the other medical professionals and their circumstances with the patients, leading to several tailor-made service concepts. Two contradicting viewpoints that would lead to different IT solutions and needs in terms of employee resources and their future competencies were not yet decided.

> We don't know how this will be resolved, either "traditional" or "future solution for different users" will win. It may also turn out that we won't have the speech recognition at all, it will depend on the procurement process as well. (Manager 35, support service unit)

Against these alternative scenarios, it was understandable that employees (typists) or future users of the system, that is MDs, were not openly and widely informed about the direction of the future technological change, although it would influence on both groups. The manager of the support service unit was not concerned about the need to reduce person-years, because a high percentage of the personnel was to retire in the next few years.

The head of unit in charge of word processing services participated in the workshops organized by the researchers. After the second workshop, he said he was positively surprised at how sophisticated the job scenario presented by the typists had been. As a result of workers' empowerment, the managers decided to involve the workshop participators in the development projects for designing the future documentation service. This indicated a change to a more "high road" strategy for treating the service workers as potential contributors to the technological transition.

15.5.4.2 Concerns of the Human Resource Managers

The upper-level HR manager pointed out varied solutions for employees if some jobs disappeared because of technological change in the large organization. They may search for open vacancies in the hospital district as a whole. However, re-educating oneself for a different occupation is mainly on one's own responsibility, as she described:

> What is extremely important is that we as an organization can tell the people what is about to happen, and involve them in the change process. So that they realize in time, that oh, if I think of my future in advance, I realize that I don't have sufficient expertise for it and have to retrain. Because I think that part of expertise is to identify the direction that my work will take. What should I master and learn? (HR 34)

The role of the HR of the entire hospital district is to train managers and supervisors of the organization to know how to lead the change.

The local HR manager of the support service unit admitted that demands for new word processing expertise are in the air, as he described:

> If we go into speech recognition, the work turns into editing. It's not about writing the text anymore. So you have to know language in a different way. Master the language and understand it in more depth. (HR 36)

However, he did not know where to get such training. Preparing the employees for radical changes was not easy, because "no absolute truth exists regarding how this will influence each occupation" (HR 36). Another challenge from the HR perspective will be how to hold on to the young and temporary employees who may have the necessary expertise, if typing work is to be terminated.

On the whole, from the backstage employee viewpoint, there were no concrete, widely influenced managerial actions for preparing for the technological changes in the e-documentation process. Instead, the managers focused on unfinished decision processes or complicated technology procurement processes. HR identified the future needs of new competencies in general but trusted that employees themselves would somehow find their way if their work changed or jobs disappeared. They also seem to be waiting for clearer decisions regarding future service process, before planning supportive training efforts for employees. This reflects a "low road" strategy for creating new skills among employees on the part of the organization as a whole (Boud et al. 2006; Monks et al. 2013). However, the two workshops in which employees were involved signaled an opportunity and an insight for managers to involve employees in the implementation process.

15.6 Discussion

15.6.1 Summary of the Main Findings

The chapter highlighted the workplace- and job-level consequences and opportunities of digitalization in a health-care organization. The results contribute to the employee-driven and human-centered perspective (Høyrup et al. 2012) in the digitalizing care service context, in particular internal support services in hospitals.

Previous research literature on the digitalization of services has tended to focus on the changing role of the customer and customer needs. The employee's role as a potential innovator of her/his future work and changing services has been neglected. We argue that the backstage worker can and should be involved in constructing future service work, even in such a case when service work in its current form is disappearing as it becomes digitally automatized. In this study, workshops provided a kind of safe arena for employees and the supervisors to ponder on the future work.

The analysis of the perspectives of managers and HR managers indicated a challenge of preparing employees and future users of the e-service before the decisions of the service concept and its technological solution were made. They were aware of the need for radical changes in the competencies of the employees, but before

knowing the direction of the change, the training efforts or even wider communication about the future change seemed obsolete.

Developmental actions and projects in service organizations should not only be concerned with future customer and employee experience but should also design the future paths of customers and employees symmetrically. When services become increasingly digitalized, the fact does not change that both customers and employees are resource integrators in the value co-creation process (Edvardsson et al. 2011). However, the change is rather radical in both positions. It demands a new kind of active agency and readiness to adopt a new role with no clear pre-descriptions or certainty regarding the future service.

Our analysis indicated that a positive, empowering atmosphere, in addition to questions and envisioning tasks guiding employees in their potential future roles in the workshop process, may lead employees to have insights into their future job descriptions. Intervenors, such as "godfathers" or "godmothers" from other organizations, may act as mentors in the process. Collaborative design in the workshops brought to light the relational aspects of agency, which reveals the interconnected nature of different practitioner groups. Participants were able to become aware of each other's support and resources and understand how the relations between them influence their choices and possibilities (e.g., Donati and Archer 2015).

To sum up, we found that when services are digitalized and current jobs are at stake, employees may find new agency, in the same way as Cinderella, who rose into a new role in the fairy tale. However, we need encouraging actions from managers and even outside intervenors, such as a fairy godmother, in order to trigger this.

15.6.2 Research Implications

The study contributes to the debate on how automation may replace human work and how the employees may influence on their future work horizons (Arntz et al. 2016; Frey and Osborne 2013). The job task-level analysis indicates that if low-educated workers' agency is encouraged in the organization, by providing them with a chance to influence future service and future work, these workers may orientate themselves into new tasks. Our case study reveals that technological reforms are not deterministic but depend on how implementation is organized among employees and users. More task-level analyses of how jobs are actually automated and cases on how employees may have an impact on their future jobs are needed. The agency of employees is relational and is an emerging phenomenon (Donati and Archer 2015), depending on whether supervisors, managers, and HR adopt a high- or low-road strategy (Boud et al. 2006; Monks et al. 2013) concerning how early in the digitalization process of the service they are ready to invest in reskilling their staff.

15.6.3 Practical Implications

We agree with Bowen (2016) that strategic HR management should focus on specifying the future employee roles and competencies that are essential to customer value creation and the success of IT-based service innovations. Shifting into new roles such as innovator, enabler or coordinator, or in our case quality control editor may require active agency from employees but also future-oriented training for increasing capabilities to adopt new roles. Service workers may become bridge-builders between ICT developers and future users. Their sensitive awareness of users' problems in using the system, as functions shift from backstage employees to users of the system, could be an asset both in training the users and making the system more user friendly (Hasu 2000, also Åkesson and Edvardsson 2008).

The role of HR management should be to provide supervisors with guidance on how to proactively manage radical changes. They could provide arenas, such as the workshops in this study, in which employees either become involved in the change processes or are allowed to imagine together how their jobs may change in the digitalization era.

Management needs to be alert to providing service workers with opportunities to foresee new kinds of work roles and tasks in time when their jobs are at stake as a result of major renewals in the service process. The task of managers is to identify the often hidden capacity of service workers, as in the story of Cinderella, when Prince Charming had to search for the owner of the glass slipper. The task of HR managers is to empower the employees so that they may be able to use their own agency in figuring out new job opportunities, as in the story of Cinderella the fairy godmother provides Cinderella new clothes to be able to participate to the royal ball.

15.6.4 Limitations of the Study and Avenues for Future Research

The findings of the study should be considered in light of the following limitations. First, the study opens up a dynamic from the perspective of only one case organization. This limits the degree to which findings can be generalized with confidence. No empirical studies concerning backstage workers in technological transition were available to enable to comparative or validating observations. However, this also makes this study a pioneer. Second, the ethnographic data were collected within a rather short period, so the interpretations were based on a cross-sectional view of the long-term technological change in Finnish health care and its digitalization. The data were collected from autumn 2015 till December 2016; this period was short as it was a small part of a larger systemic change in the patient information systems of the entire hospital district.

As regards avenues for future research, this study presents several possibilities. First, the time period for studying how the agency of employees develops when

decisions regarding IT systems are made could be extended; and the actions of managers, employees, and the users (MDs) of the possible speech recognition systems are further observed. Second, this study may inspire investigations into other occupations that are at stake in the digital era and into how the agency of other employees differs from that of the typists.

It would also be interesting to examine how organizations prepare their personnel for radical technological change in service processes and to evaluate whether there is a tendency toward technology-oriented, customer-oriented, or employee-oriented strategy guiding in the transitional phase. It is clear that studies of both hidden and visible reasons for how and why digitalization is changing work, both backstage and frontstage service work, are very much needed.

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Chapter 16
How Society Can Maintain Human-Centric Artificial Intelligence

Joanna J. Bryson and Andreas Theodorou

Abstract Although not a goal universally held, maintaining human-centric artificial intelligence is necessary for society's long-term stability. Fortunately, the legal and technological problems of maintaining control are actually fairly well understood and amenable to engineering. The real problem is establishing the social and political will for assigning and maintaining accountability for artifacts when these artifacts are generated or used. In this chapter we review the necessity and tractability of maintaining human control and the mechanisms by which such control can be achieved. What makes the problem both most interesting and most threatening is that achieving consensus around any human-centered approach requires at least some measure of agreement on broad existential concerns.

Keywords Systems artificial intelligence · Cognitive architectures · Ethics · Safety · Real-time visualization

16.1 Introduction: Remit and Definitions

The greatest challenges of appropriately regulating artificial intelligence (AI) are social rather than technical. First, we cannot agree on a definition of the term, even though there are perfectly well-established definitions of both *artificial* and *intelligence*. The primary problem is that we as humans identify as intelligent, which certainly is one of our characteristics, but that does not imply that *intelligent* means "human-like." We are not only intelligent but tall, long-lived, and terrestrial, at least

J. J. Bryson (✉)
University of Bath, Bath, UK
e-mail: jjb@alum.mit.edu

A. Theodorou
University of Bath, Bath, UK

Umeå University, Umeå, Sweden
e-mail: andreas.theodorou@umu.se

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compared to other vertebrates (animals with spines). So, from the outset it should be clear that this chapter is not—or not principally—about artificial humans, but about all artifacts that are intelligent. This includes not only humanoid robots but a wide range of intelligent tools and services, including social media platforms, driverless and AI-enhanced conventional automobiles, smartphones, spellcheckers, and thermostats.

The term *human* in this chapter will be reserved to mean members of the species *Homo sapiens* as a species is ordinarily recognized in biology. While it is at a minimum generous and possibly highly moral to concern ourselves about the well-being of anything that could share phenomenological sensations such as pain and loneliness that members of our species do, it is essentially impossible that we will ever build something from metal and silicon that will be as phenomenologically similar to us as rats or cows are. So again, it is worth being clear from the outset that this chapter is not about humans that have been created via cloning or other forms of intentional but slight alterations of what is fundamentally our evolved biological design. Rather, this chapter concerns artifacts built from the ground up, though we do mean to include systems with nondeterministic elements of design such as machine learning or random number generators. We will however leave discussions of problems concerning the phenomenological experiences of such artifacts until humanity has agreed to avoid the suffering of rats and cows.

Having said how we do not define "intelligence," it is now appropriate to discuss how we will. For the purpose of this chapter:

- An *agent* is anything capable of altering the world. This includes chemical agents.
- *Computation* is the systematic transformation of information from one state to another. Computation is a physical process, requiring time, space, and energy.
- *Intelligence* is a special case of computation that generates a special form of agency where actions (alterations of the world) are generated from perception (informed sensing of the world). Intelligence is a property of an agent that allows that agent to change its world *in response to contexts*: to opportunities and challenges. This recognition and addressing of the environment is achieved via computation. This definition is widely used in both natural and artificial intelligence and dates to at least the nineteenth century (Romanes 1883).

Artificial intelligence (AI) is simply intelligence expressed by an artifact, which for simplicity we will define as something built intentionally by a human or multiple humans working together.

We also define two more terms that are the real sources of societal concern that are often misdirected toward the term *intelligent*.

- A *moral agent* is an agent that a society holds responsible for its own actions.
- A *moral patient* is any entity that a society considers it to be the responsibility of moral agents to protect.

While we may often think that such concepts must be universal—and certainly historical ethical systems such as religions will often lead us to believe this is so—in

fact there is tremendous variation by society on these details. Only recently have many humans come to recognize climate as a moral patient. Different nations and even states within nations have different ages at which they consider a human to be old enough to vote, fight in a war, choose a marriage partner, or consent to sex. Given that these are some of the most momentous decisions an individual can make, it is striking that there is no universal agreement on when moral agency is achieved. From this it becomes evident that ethics itself is a social construction. In fact arguably, ethics may be definitionally the means by which a society constructs itself, an idea explored at more length by Bryson (2018).

Finally, the title of this chapter implies that we already have human-centric AI. This is largely true, though arguably not entirely. We certainly do already have AI by the straightforward definitions given here. First, we have technology like Web search, spell and grammar checking, and Global Positioning System (GPS) navigation systems—all AI that billions of people interact with daily. These are AI as service, intelligent systems that transform data into recommendations that we act upon or not. But secondly, some would argue that our existing corporations and governments are excellent examples of AI (List and Pettit 2011). True, these artifacts include humans as part of their systems, but they are also already exactly the sort of phenomena some describe when they use words or phrases like "superintelligence" or "artificial general intelligence." Human society as a whole is increasing its capacity to learn exponentially, by extending ourselves through our artifacts and also just by extending our own sheer numbers. Many of the artifacts benefiting this system are not AI, but simply communication, education, and nutritional technologies which make us as individuals smarter and give us access to each other's capacities for intelligence. But the identified challenges of superintelligence such as runaway processes overconsuming available resources (Bostrom 2012) are a good description of humanity's present challenges with respect to sustainability.

The extent to which governments, corporations, and their technological tools are human-centric can be debated, but more often the debate concerns who among humanity benefits, not whether something other than a subpopulation of humans is truly benefiting. This chapter does not seek directly to solve this question but does assume that governments and corporations at least are focused on and controlled by at least some set of humans. Our purpose is to show that similar or greater levels of control can and should be expressed over the AI products humans produce. At the highest level, the means by which this objective may be achieved is by maintaining ordinary levels of human accountability for the devices we produce. We will go into greater detail about how this can be achieved below, but first we discuss why it should be.

16.2 Why Maintain Human-Centric AI

As just admitted, "maintaining" human-centric AI isn't exactly the situation we find ourselves in. To the extent that corporations or governments function to serve their own persistence even where that does not benefit humanity, then AI may already be

seen as not human-centric. The extent to which this is the current situation is much debated. This will not be the focus of this chapter, but we will return to this question briefly at the end of this section. For the purpose of the present chapter, we will assume that these institutions largely serve humanity and that what we really mean by our title is that we wish AI to make the situation no worse than it is, and perhaps even to improve it.

There are many possible humanist reasons to maintain human-centered control. First, we should say that there are two possible alternatives, which actually amount to much the same thing. The first is that we lose control absolutely, and the second is that control is handed from humanity to our artifacts. While there will always be anarchists and nihilists arguing for the former, we will neglect that option here since people holding such positions are unlikely to become organized enough to dismantle control globally. The latter though is seen by many as desirable or even necessary. Aware of their own mortality and that of civilizations and species as well (cf. Scranton 2015), they put their hope in artifactual progeny. Perhaps this is because (ironically) they can exercise more control over artifacts than over biological progeny, or perhaps they mistakenly believe that machines (unlike humans) can be immortal or omniscient. The fact that the average working "life" of an artifact is far, far shorter than the average life-span of a human (or even a chimpanzee) is apparently regarded as irrelevant. Perhaps they think machines can be made self-repairing, but in this sense so are biological lineages (Taylor and Bryson 2014). Again, that any purely mechanical technology lineage we produce will exceed the life-span of our biological lineage is phenomenally unlikely.

It seems that the problem is that AI is viewed not as a type of computation—a physical process, but as a type of math—an abstraction. Mathematics may be eternal and perfect, but that is because it is not real. Computation being a physical process requires time, space, and energy. Even if we are able to achieve at some stage long-term energy independence (at least relative to our level of demand), we will always be constrained by space and time.

The above are only reasons not to argue against human-centered AI, but here we give two reasons to argue for it. First, every aspect of our values—not only our ethics and our human drives and desires but also our sense of aesthetics—all of these have coevolved with our species and societies in order to maintain our species and societies (Bryson and Kime 2011). There is no coherent sense in having machines enjoy hedonism for us, although we can use machines to capture resources that we could not ourselves exploit, preventing them from being exploited by others. While some openly find pleasure in such an expression of power, it is not something we choose to openly condone here, and we doubt it would be condoned by the majority of any stable society were they to recognize this as being the impulse for their support of "artificial life."

Second, all social order is based on concepts and institutions of justice that unfortunately have human suffering at their core as a means of dissuasion (Bryson et al. 2017). Law may seem to create compensation, and we could imagine a machine, for example, financially compensating for its wrongful actions. But in fact, law is mostly about dissuasion. Laws and treaties are a means by which we set

out agreed behavior and agreed costs of violating that behavior. We have coevolved with these institutions for so long that we really do *feel* like we've received some form of compensation when in fact we have only received justice. For example, if someone kills your lover and that killer goes to jail, you have received nothing remotely like what you have lost, but you perceive victory. In fact, perhaps part of what you lost is social status and faith in the system, and perhaps justice returns these to you. But these abstractions exist in order to maintain social order and rest upon our biological architecture that makes stress and pain pervasively dysphoric and isolation and loss painful and stressful.

We cannot build machines that can so systemically experience such pervasive dysphoria. Probably we cannot build such a machine at all, but certainly we cannot build one for which we can guarantee its safety. In fact, here we return to the idea that AI is already somewhat out of our control, if we accept the List and Pettit (2011) account of corporations as AI. Corporations are extended legal personhood as a legal convenience, but it's a convenience allowable only because real humans are dissuaded from doing wrong by human justice. And we should not have said "because"; we should have said "to the extent which." A shell company dissociates the humans who would suffer if the company does wrong from the humans who decide what the company does (cf. Bryson et al. 2017). Weapons such as guns, airplanes and bombs, and also chains of command (military or corporate) similarly remove individuals at least some ways from the consequences of their decisions, which makes decisions with deeply aversive consequences easier to take.

The primary reason to maintain or even increase the extent to which AI is human-centric is that to do otherwise would far more likely allow a greater dismantling of justice, resulting in greater human suffering, than it would be to produce a new form of social or somehow universal good.

16.3 Maintaining Human Control Through Design

There are two means by which human control may be maintained over AI. First, good design of AI systems allows us to ensure that intelligent systems operate within the parameters we expect. Contrary to some contemporary horror stories, machine learning (even DNN) doesn't make this difficult. It is not hard to ring fence what aspects of an AI system are subject to (can altered by) its own learning or planning. In fact, constraining processes like learning and planning allows them to operate more efficiently and effectively, as well as more safely. This is because the amount of computation (time, space, and energy) required is directly related to the amount of possibilities that need to be explored. Thus, appropriate constraint is one of the main means for making any system, including humans, smarter. We teach students the sets of tools, facts, and approaches that have been shown to date most likely to produce useful outcomes.

The second means of maintaining human control is by holding those who build, own, or operate AI accountable for their systems through law and regulation. This

approach will be described in the following section, but requires first understanding that the first approach is both possible and desirable. That is the focus of this section.

To begin with, it has long been established that the easiest way to tackle very large engineering projects is to decompose the problem whenever possible into subprojects or *modules* (Bryson 2000). For example, one component of a driverless car is the GPS navigation system, which has been so completely modularized that it is routinely used by enormous numbers of human drivers daily. There is no reason that a single automobile's "mind" should alter the algorithm by which new routes are chosen, although the observations of an automobile may contribute to the crowd-sourced data on the current traffic on a road or even the nuances of controlling a particular make of car. Here again, even if such a crowd-sourced learning strategy is used to recognize and avoid congestion, the constantly updating models of the current traffic conditions will not alter the independent model of the underlying roads. Neither model will have any direct access to control over where or whether the car moves, which is another module still, or for the time being, more likely a human driver.

More generally, one method for designing modular decomposition for an AI system is to assess what the system needs to know and, for each aspect of that knowledge, the best way to maintain that knowledge, as well as to exploit it. Here we describe one such approach to systems engineering real-time AI. We use this as a case to demonstrate what is possible and then to illustrate the more general claims about accountability, transparency, regulation, and social control of AI made in the section following.

16.3.1 Behavior-Oriented Design

The above observation—that an ontology of required knowledge and its most convenient representation for expressing timely action should be used as the basis for modular decomposition for intelligent systems—is a core contribution of Behavior-Oriented Design (BOD), which is one methodology for systems engineering real-time AI systems (Bryson 2001, 2003). BOD takes inspiration both from the well-established programming paradigm of object-oriented design (ODD) and its associated agile design (Cockburn 2006; Gaudl et al. 2013) and an older but still very well-known AI systems engineering strategy called behavior-based AI (BBAI, Brooks 1991). BBAI lead to the first AI systems capable of moving at animallike speeds, and many of its innovations are still extremely influential in real-time systems today. Although renown for depricating internal memory ('representation'), we would argue that the primary contribution of BBAI was to emphasize design—specifically, modular design. Previous AI researchers, inspired by their interpretation of their own conscious experience, had expected to express the entire world in a system of logical perfection and then to take only the provably optimal action (Chapman 1987). BBAI instead focuses on:

1. The actions the system is intended to produce.
2. The minimum, maximally specialized perception required to generate each action.

In BBAI, each module derives action from its own dedicated perception.

While based in real-world experience of building robots, and as mentioned being the first approach that really succeeded in animal-like navigation at animal-like speeds, there were problems with BBAI as Brooks originally construed it. The first problem with this approach is coordinating the modules. Decomposing for simplicity is of little use if the subsequent coordination proves intractable. Second, Brooks' experience with traditional robot planning and the complexities of dealing with the world lead him to dismiss any real-time extension of intelligent control whatsoever. BBAI in its original form has no onboard planning (at least, no revision of the priorities encoded in the AI) nor any learning whatsoever. Brooks initially claimed (like Lorenz before him) that embedding intelligence in its ecological niche was too delicate a problem to be open to risky processes like onboard learning, and that what appeared to be thought and learning were epiphenomenal suppositions imposed by us as observers as the organism interacted with a complex environment. "The world is its own best model" (Brooks 1991). While this emphasis revolutionized AI by refocusing it on proper systems design, it cannot really account for all of human-like or even insect-like behavior (Papaj and Lewis 2012).

BOD connects AI properly back to systems engineering via OOD, affording safety in AI by exploiting BBAI-like modular architectures to limit the scope of machine learning, planning, or other real-time plasticity to the actions or skills requiring the capacity to accommodate change. Such architectural design is essential not only for safety but also simply for computational tractability. As mentioned earlier, learning systems are faster and more likely to succeed if they are conducting their search over relevant possible capacities. Brains do the same thing. Contrary to Skinner (1935), pigeons can learn to peck for food or to flap their wings to escape shock, but not to flap their wings for food or to peck to avoid shock (Gallistel et al. 1991). Biological evolution also provides architecture as scaffolding for viable systems. Again, in contrast to some sensationalist contemporary horror stories, there are in fact zero AI systems for learning chess that represent power switches or have access to guns. No AI system built to learn chess will ever shoot someone that moves to turn it off at night.[1]

BOD makes such commonsense architectural decisions an explicit part of its development process. In general BOD is one means of using systems engineering to overcome problems of complexity for intelligence, by introducing an ontology, methodology, and architecture that promotes iterative design and testing. BOD includes commonsense heuristics for modular decomposition, documentation, refactoring, and code reuse. By using well-established OOD techniques, BOD allows decomposition of intelligent behavior into multiple modules forming what

[1] Another stupidity of the gun-toting, chess-learning murderous AI fairy tale propagated by the Future of Life Institute is that real AI developers *prefer* our systems to do work while we sleep.

we call a *behavior library*. Behavior library modules may wrap machine learning systems or indeed commercial AI services providing specific capacities such as face recognition or navigation.

Stringing these modules together into a coherent agent requires then only specifying the priorities of that agent. Notice that multiple agents with completely different goals can be constructed from the same behavior library, providing only that they either exploit the same type of hardware platform or that the modules have been constructed to be platform-independent. Aspects of intelligence can also be hosted on servers or in clouds and accessed over an API, but of course for a real-time system, much critical intelligent infrastructure needs to be hosted in a way such that the communication rate between modules and their embedded hardware substrate can be guaranteed. Further, any system learning proprietary information, e.g., about its owner's household should probably better host such information securely and solely on site (Kalofonos et al. 2008).

16.3.2 Specifying a System's Priorities

One of the innovations of BOD compared to both BBAI and OOD is to simplify the problem of arbitrating between different modules that might otherwise produce contradictory actions away from a highly distributed, difficult to conceptualize or design network of dependencies and back toward a more traditional hierarchical representation of priorities. Of course, there were good reasons for Brooks' original avoidance of these hierarchies, concerning efficiency. As Blumberg (1996) observed, action selection is only necessitated where there is competition for resources. If no such competition exists, the behavior modules are able to work in parallel. However, many things are in this sense a resource, including a robot's physical location, direction of gaze, and what it can hold on to.

Bryson (2001) introduces POSH (Parallel-rooted, Ordered, Slip-Stack Hierarchical) action selection. These ideas were taken up also by the far better-named Behavior Trees (BT, Isla 2015; Rabin 2014) which function just as well for BOD systems engineering of real-time AI, but here we focus on our original nomenclature. For historic reasons, the data structure built from POSH (or BT) components, describing an agent's priorities, is termed a *plan*, and the part of the AI system that checks these priorities is called a *planner*. This is true even though the planner typically will not alter the POSH plans in the system, but the planner and the plans together determine the sequence of steps the agent takes in pursuing its goals, which might be more conventionally seen as a plan.

POSH plans combine faster response times similar to the fully reactive approaches for BBAI with a greater ease of developing goal-directed plans. A POSH plan consists of the following elements:

1. Drive collection (DC): This is the root or apex of the plan's hierarchy. It contains a set of drives and is responsible for giving attention to the highest priority drive

that presently could use that attention. The POSH planning cycle alternates between checking for what is currently the highest level priority that should be active and then progressing work on that priority. This check is made hundreds or thousands of times a second, to ensure the system's highest priority goals (which should ensure its safety) are constantly monitored.

2. Drive (D): Allows for the design of behavior in pursuit of a specific goal. Each drive maintains its execution state even when it is not the focus of planner attention, allowing the system to express coarse-grained parallelism even within prioritized actions, as well as independently by modules not requiring arbitration. Each drive specifies its own perceptual context which is suitable to or requires its deployment, while the DC as a whole maintains track of the multiple drives' relative priorities.
3. Competence (C): A simpler hierarchical plan element for representing the priorities within a particular component of a plan (also known as a subplan). Competences are similar to the drive collection but lack the extra checks and mechanisms for concurrency, which are handled entirely at the top level or root D. Each competence contains one or more competence elements (CE), which also are associated with both a priority relative to the other CEs and a context which can perceive and report when that element can execute. The highest priority action that can execute will execute when the competence receives attention.
4. Action pattern (AP): These are simple sequences of actions and perceptions used to reduce the design complexity of a plan when such a sequence of actions can be determined in advance.
5. Action (A): A call to code in the behavior library that sets a skilled act in motion. To maintain agility in the planner, actions should not block (wait for a final response in the world) but simply return immediately with a code indicating whether or not the action was successfully initiated. Other plan elements can be designed to watch for a context in which this action has succeeded or failed if that knowledge is essential. However, in both biology and AI, quite often actions are just run "open loop," without checks, and action selection is simply repeated in the next instant in the new context produced by the agent's actions or inactions as time has progressed.
6. Sense (S): Senses are very much like actions and also depend on the behavior library for their implementation. The difference is that they return a value indicating context, which may be used to determine, for example, whether a drive or competence should be released to execute or an action pattern aborted. Since plans do block waiting for this return value, the code for S should execute quickly. Often it returns a value from memory, the up-to-date value of which is maintained by a behaviour module in a parallel process.

Taken together, these plan elements are sufficient for expressing the goals of many systems. Of course, for complex systems with multiple, potentially conflicting goals (e.g., maintaining a job and maintaining a relationship, or hoovering the house and entertaining the dog), it may be useful for the order of priorities to shift over time. For this we have developed several systems of synthetic emotions or

moods. Essentially, a mood or emotion is a special type of behavior module that determines its own current priority. Drives linked to these emotions have from the drive collection's perspective the same level of priority, and a separate system ensures that only one of these at a time receives the focus of attention (Bryson and Tanguy 2010; Gaudl, and Bryson 2018; Wortham et al. 2018).

16.3.3 Real-Time Debugging of Priorities

Another myth of AI is that systems should become as intelligent as humans and therefore not require any more training than a human. In reality, very few owners or operators will want to put as much energy into training an AI system as is required to raise a child or even to train an intern, apprentice, or graduate student. Programming is generally a far more direct and efficient way to communicate what is known and knowable about generating appropriate behavior. However, debugging a complex, modular, real-time system requires more insight than ordinary programming. Further, we may well want to allow nonprogrammers to set priorities and choose between capacities for their agents once reliable behavior libraries have been defined. Both of these activities require an element of transparency to a system. Here we use *transparency* to mean that the direct workings of the system should be made apparent—visible and understandable (Bryson and Winfield 2017; Theodorou et al. 2017).

Hierarchical definitions of priorities like POSH plans or Behavior Trees offer a sensible means of transparency for either of these two applications: expert debugging or ordinary user understanding. Here we again describe novel work in our own group, but the basic concept behind this may be generalized to other forms of systems engineering. At Bath, we have developed a real-time visualization system and debugger for POSH plans. The system, ABOD3, is based on, but a substantial revision and extension of, ABODE (a BOD environment, originally built by Steve Gray and Simon Jones, Bryson et al. 2005; Brom et al. 2006). ABOD3, first described by Theodorou (2017) and shown here in Figs. 16.1 and 16.2, allows the graphical visualization of POSH-like plans. The editor, as seen in its architecture diagram in Fig. 16.3, is implemented in such a way as to provide for expandability and customization, allowing the accommodation of a wide variety of applications and potential users.

ABOD3 is designed to allow not only the development of reactive plans but also the debugging of such plans in real time. The editor provides a user-customizable user interface (UI). Plan elements, their subtrees, and debugging-related information can be hidden, to allow different levels of abstraction and present only relevant information to the present development or debugging task. The graphical representation of the plan can be generated automatically, and the user can override its default layout by moving elements to suit needs and preferences. The simple UI and customization allows the editor to be employed not only as a developer's tool but also has been demonstrated to present transparency-related information to naive users that helps them develop more accurate mental models of a mobile robot (Wortham et al. 2017a).

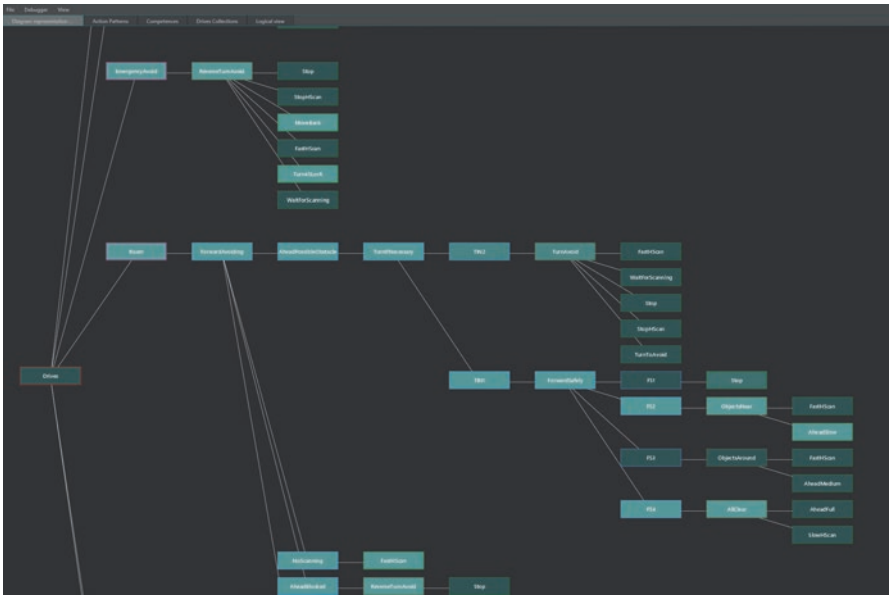

Fig. 16.1 The ABOD3 Graphical Transparency Tool displaying a POSH plan for a mobile robot, in debugging mode. The highlighted elements are the ones recently called by the planner. The intensity of the glow indicates the number of recent calls

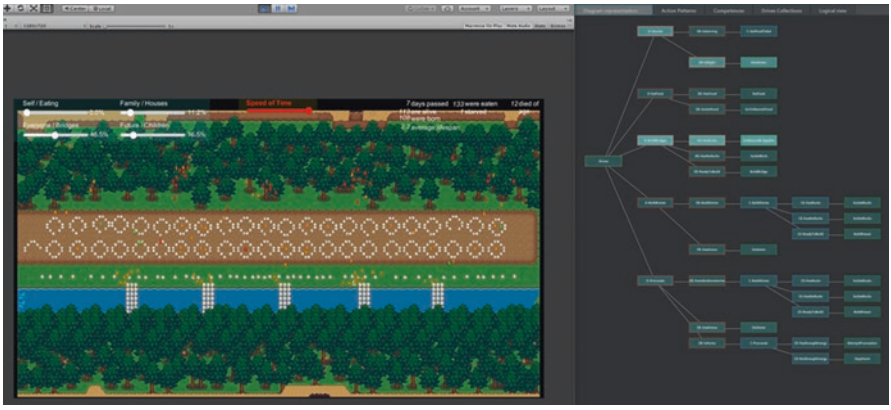

Fig. 16.2 ABOD3 implemented as part of a serious game (the Sustainability Game) so that game players can understand the interaction between agent motivations and the viability of an artificial community (Theodorou et al. 2017)

Plan elements flash as they are called by the planner and glow based on the number of recent invocations of that element. Plan elements without any recent invocations start dimming down, over a user-defined interval, until they return back to their initial state. This offers abstracted backtracing of the calls and the debug-

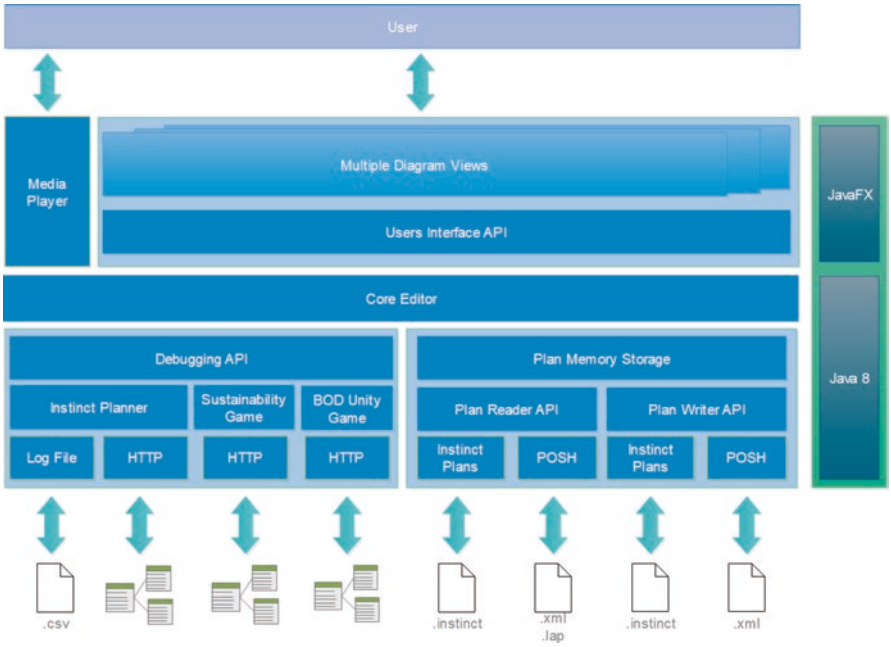

Fig. 16.3 System architecture diagram of ABOD3, showing its modular design. All of ABOD3 is written in Java to ensure cross-platform compatibility. APIs allow the support of additional BOD planners for real-time debugging or even multiple file formats for the plans. The editor is intended, through personalization, to support roboticists, software AI developers, and ordinary users interested in AI systems

ging of a common problem in distributed systems: race conditions where two or more subcomponents are constantly triggering each other and then interfering with or even cancelling each other's effects. Finally, ABOD3 can also support integration with videos of the agents in action, allowing for non-real-time debugging based on logged performance. Logging of actions taken and contexts encountered is a substantial aspect of AI accountability and transparency, which we will return to in the next section.

16.4 Maintaining Human Control Through Accountability and Transparency

To reiterate, although we have here described the systems engineering approach and tools we have been developing together at the University of Bath, we are not claiming that these are the only, best, or most essential means for maintaining human control of AI. We are rather communicating that such control is perfectly possible and illustrating examples of some of the technological mechanisms by which such

control can be maintained. It is also perfectly possible to build AI for which accounting is not possible, indeed this too has already been done and is too prevalent in our society (Pasquale 2015). In this section, we summarize what is essential about technological mechanisms for human control and then close with a discussion about the social, legal, and political mechanisms for maintaining that control, which are actually far more important. Technology serves and extends human societies, but ethics is what forms and defines human societies.

16.4.1 Technological Mechanisms for Ensuring Transparency and Accountability

What is important to realize is that every aspect of an artifact is a consequence of design decisions. We are not saying that it is trivial to know what any AI system is doing. We *are* saying that it is possible to provide the tools and keep the records such that we know *at the level sufficient to maintain human accountability* what goes wrong with a system, if it goes wrong, and how and why it was constructed such that it did go wrong. There are social requirements underlying these technological features: can a person or a company show that they followed due diligence when they created an artifact? If not, they should be held liable for what that artifact does.

This does not mean that AI has to be deterministic or formally provably correct. Due diligence can be demonstrated by corporations despite the fact they employ people. People learn, have free will, and have incomprehensible systems of synapses making up their action selection mechanisms. Many humans are dishonest, careless, or sometimes just upset or incompetent. Nevertheless, we can construct systems that ensure that humans working together tend to succeed. These systems generally include records, such as financial accounts, access permissions, and minuted meetings where executive decisions are agreed. They also include external regulatory bodies and law enforcement.

Exactly the same kinds of procedures can be used for retaining control of AI and indeed already are at least in well-regulated sectors like the automotive industry (Doll et al. 2015). In every single case so far concerning a human fatality involving a driverless car, newspapers have within a week shown us exactly what the car perceived, how that perception had been categorized, and what actions the car was taking at the point of fatality, and even why. Keeping records of this sort of information is not difficult, but it *is* a design decision. That decision is enforced in the automotive industry by its high levels of regulatory accountability mandated by the incredible amount of human suffering and death generated as its by-product (Williams 1991). The design decision to provide adequate logging is one we can and should also enforce for other AI systems in socially critical roles.

As we described in the previous discussion of modularity and safety, the equivalents of "access permissions" are also a completely standard part of design that anyone with any practical experience of creating an intelligent system takes for

granted. Every sensor or actuator a system has is an expense for its manufacturing, so these will naturally be restricted to those required by a system's task, but further within the system, access to information can and should be restricted to that information likely to be useful, not only for safety but simply for efficiency.

In addition to logging what a system perceives and performs, we can also log every aspect of how we designed that system. Standard practice in software development is to use a software revision control system that documents the exact author and timing of any change to the system's software. Unfortunately, not every development team will exercise best practice in terms of ensuring that each individual developer has its own individual login, or documents the reasons for their changes, or documents the versions of software libraries used to support their programming or data libraries used to train their machine learning. In fact, there has been a well-documented, scandalous disregard for the provenance of both software libraries (Gürses and van Hoboken 2018) and data libraries (Pasquale 2015). However, there is no technological reason that a better standard of practice couldn't be generated and even required.

All of the mechanisms described above, and also the architectural concepts and software tools described in the previous section, are mechanisms of transparency. To be clear, when we talk about transparency here, we mean neither invisibility (as is sometimes advocated by human-computer interaction specialists) nor (necessarily) mandatory open-source code or formal, symbolic programming. The former—invisibility—actually *increases* the hazard of AI as ordinary users fail to realize their data is being gathered or to consider the consequences of compromising the security of the system. The latter can produce more information than humans can accommodate without resulting in clarity about responsibility or good practice. What is effectively transparent therefore varies by who the observer is and what their goals and obligations are (Bryson and Winfield 2017; Theodorou et al. 2017).

The goal of transparency is never complete comprehension. That would severely limit the scope of human achievement. Rather, the goal of transparency is providing sufficient information to ensure that at least human accountability, and therefore control, can be maintained.

Our position about transparency is supported by Dzindolet et al. (2003), who conducted a study where the participants had to decide whether they trust a particular piece of pattern recognition software. The users were given only the percentage of how accurate the prediction of their probabilistic algorithm was in each image. Yet, by having access to this easy-to-implement transparency feature, they were able to calibrate their trust in real time. Our own studies (discussed in Wortham et al. 2017a, b) demonstrate how users of various demographic backgrounds had inaccurate mental models about a mobile robot running a POSH planner. They were ascribing unrealistic functionalities, potentially raising their expectations for its intelligence and safety. When the same robot was presented with ABOD3 providing an end-user transparency visualization, the users were able to calibrate their mental models. This leads to more realistic expectations concerning the system's capabilities, though interestingly also a higher assessment of its intelligence.

16.4.2 Maintaining Human Control Through Governance and Regulation

There has at various periods, including the present, been a worrying tendency to blame individual scientists or programmers for the consequences of their work. While it is true that individuals are accountable for their actions—including life choices concerning their employers—successful regulation requires looking at the entire context of that action. If we know there will or at least can be individuals who are dishonest, sloppy, suicidal, corrupted, or simply prone to occasional errors (i.e., human), then we should expect systems containing such individuals should have some means for ensuring and promoting the quality of their work. For AI, the scale of this task may sound insurmountable—do we really think we should check the work of every individual programmer, globally? Who would do such a thing? Yet this is *exactly* what Apple does for individual programmers who want to write software applications for Apple's smart phone, the iPhone. Smart phones are the most fantastic information-gathering devices ever created, so it makes sense to have this level of security and scrutiny enforced by the maker and owner of this platform. Note also that despite the cost of such an operation, Apple has a perfectly successful business model for producing wealth as well as products.

We mentioned in the previous section that car manufacturers are also already developing vast amounts of AI in a highly regulated environment. At least some of them have also been able to successfully demonstrate that they practice due diligence when they are investigated by state prosecutors (Doll et al. 2015). But what about organizations that changed the world in unanticipated ways by introducing entirely new platforms and therefore capacities into societies and economies? Can they also be held accountable for damage done with the tools they provided?

This is a question being addressed in courts and legislatures globally as we write, but we believe that the short answer is "yes, to a point." That point is demonstrated community standards of good practice. So, if, for example, damage results from the obviously poor (and often illegal) standards of conduct documented by Pasquale (2015) or Gürses and van Hoboken (2018), then governments and other collectives should hold organizations that profit from this conduct accountable for the damage they cause. Similarly, if most organizations refuse to sell access to the data they collect from their users because doing so would seem a clear ethical violation, but some organizations do sell such data, then these latter organizations can be held accountable for violating the known ethical standards of their sector. This is particularly true for organizations of scale, which are routinely held to higher standards by the law because of their position of leadership. With great power (or even just money) does indeed come great responsibility.

In discussions held in the United Kingdom (UK) at least, it appears that there is not really a call for changes in legislation (House of Lords 2018). Rather, what is needed is only to get through the fog of confusion caused by the smoke and mirrors associated with "intelligence." This is why we started this chapter as we did, to make it clear that AI and indeed I are ordinary properties amenable to both science

and law. Once this is clear, then with a little education and some good hiring, ordinary legal enforcement of liability standards should be sufficient to maintain human control.

AI does present two special problems, however. One we mentioned earlier but return to here. There is a mistaken belief that the capacity to express human-like behavior is in any way indicative of commonality of phenomenological experience between machines and humans. As Caliskan et al. (2017) demonstrate, a glorified spreadsheet that has just counted words on the Internet can report phenomenological commonality with humans, e.g., that flowers are more pleasant than insects, or even stereotyped beliefs such as that women's names are more associated with the domestic sphere. Such a system barely even qualifies as AI by the definition we've given since the only "action" from its perception of the Web is the numerical report of what words are associated with what others. Further, these counts are replicated globally in standard AI tools, so there is no hazard of loss of a unique perspective if we destroy one of these spreadsheets, as there is if we lose a single human life, or even a unique copy of an old book or fossil. Humans act differently around robots that look human to them, but then humans act differently around statues that look human. Public spaces that had felt and been dangerous feel and become safer when ordinary human statues are introduced at ordinary human scale (Johnson 2017). Thus, reports of phenomenological similarity generated either by AI or by human observers cannot be seen as valid demonstrations of AI moral patiency.

Unfortunately, many people argue that empathy is core to ethics. Empathy is a terrible metric of moral patiency; it is extended more to those more like us (Bloom 2017). Also, people are moved to self-deception by their fear of mortality and desire for powerful progeny and partners. There are many proposals to extend the mechanisms that sadly often fail to protect humans to protect robots or AI (Gunkel 2018). We share the goal of not wanting any entity to suffer unnecessarily, but we take this to imply we should design AI so that it will not suffer, and further to ensure that damage to systems containing AI would not incur human suffering. Again, it is a design decision whether we make AI that is robust, can be backed up, and thus can be protected by standard means for protecting and preserving digital data. Designing for such robustness is the only ethical decision for AI that anyone cares about, and eliminates the necessity of the sorts of protections extended to unique human lives.

Another problem with mistakenly thinking AI is human-like is believing that human punishments such as social shunning, fines, prison, and the other tools of human law could be extended to control AI systems. Again, if we accept the List and Pettit (2011) definition of corporations as AI, we can already see that where the humans who make the decisions are not the humans who will be held to account, corruption follows. If we make artifacts to be legal persons, those artifacts will be used like a shell company, to evade justice and corrupt economies and power structures (Bryson et al. 2017), leaving ordinary citizens disempowered with less protection from powerful institutions (Elish 2016).

The second special problem of AI is not actually unique to it but rather a characteristic of Information Communication Technology (ICT) more generally. ICT thanks to the Internet and other networking systems operates transnationally and

therefore affords the accumulation of great wealth and power while simultaneously evading the jurisdiction of any particular nation. This means that appropriate regulation of AI requires transnational cooperation. Again, the process to establish transnational agreements, treaties, and enforcement mechanisms is nontrivial, but it is already known and already underway.

16.5 Conclusion

In conclusion, societies both can and should maintain control over artificial intelligence. Fortunately, significant progress is being made in achieving this goal—progress made by technology companies, regulatory bodies, governments, professional organizations, and individual citizens including software developers who are taking the time to understand the social consequences of technology. We welcome the opportunity to describe these efforts here and encourage our readers to join the perpetually ongoing project of creating a richer, fairer, and more just society in which we may all flourish with dignity.

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