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Gabriele Vogt & Anne-Sophie L. König

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Robotic devices and ICT in long-term care in Japan: Their potential and limitations from a workplace perspective

Gabriele Vogt and Anne-Sophie L. König

Department for Asian Studies, Ludwig-Maximilians-Universität München (LMU Munich), Japan-Zentrum, München, Germany

ABSTRACT
In light of its rapidly aging society, Japan is pressured to full-heartedly address the labor shortage in long-term care. Among the various policy options currently in discussion, government agencies and business sector representatives agree that robotic devices and information and communication technology (ICT) constitute a suitable countermeasure. However, during our research in Japan in 2019, we found that robotic devices and ICT are only reluctantly being introduced into long-term care facilities. Based on our field visits and interviews as well as supplementary document research, this paper discusses the potential that facility managers ascribe to robotic devices and ICT when it comes to alleviating the labor shortage in the long-term care institutions they run. Of particular interest is the question to what degree the usage of robotic devices and ICT could reduce the physical hardships and mental stress that staff in long-term caregiving experience. This paper will further our understanding of the labor situation in long-term care facilities and contribute to the research field of robotic devices and ICT in Japan's labor market.

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Japan; long-term care; labor shortage; population aging; robotic devices; ICT

Introduction

Policymakers in Japan have been following a multi-layered path to address the demand for long-term caregivers, which stood at 1.49 million in fiscal year 2012, and is expected to rise by an additional million by 2025 (JILPT 2015, 55). This strategy includes the immigration of health-caregivers from Southeast-Asian countries (Hirano and Yoneno 2021; Vogt 2018), the activation of women and elderly as professional caregivers (JILPT, 2015, 60; Shinkawa 2012), and also the introduction of robotic devices and ICT (information and communication technology) into the sector (Brucksch 2020; Eggleston, Lee, and Iizuka 2021). In fact, many care facilities follow more than just one approach in their attempt to address labor shortages (Shinkawa 2012; Wright 2019), and oftentimes the various strategies supplement each other.[1]

CONTACT Gabriele Vogt gabriele.vogt@lmu.de Ludwig-Maximilians-Universität München (LMU Munich), Japan-Zentrum, Seminargebäude am Englischen Garten, Oettingenstraße 67, München 80538, Germany

[1]Devices based on ICT, e.g. can assist non-Japanese caregivers in filling out patient records in Japanese (BEN 02, 5 February 2019).

These various approaches notwithstanding, it is apparent that policymakers and business sector representatives prefer addressing the labor shortage in long-term care through the introduction of robotic devices and ICT. Already 15 years ago, a high-ranking member of the Liberal Democratic Party and legislator in the House of Representatives insisted in an interview with one of the authors that Japan would not need to open its doors to international labor migrants, since its outstanding success in the field of developing and diffusing robotic devices and ICT would prevent any labor shortage in long-term care from occurring (POL 01, 2 February 2006).[2] Indeed, Japan's generous public funding strategy and strong focus on commercialization on robotic devices and ICT (Wright 2021) as well as the longstanding prominent display of some of these products in international trade fairs (JAS 01, 30 January 2019) have contributed to the international image of Japan being a forerunner when it comes to utilizing robotic devices and ICT in health caregiving. Beyond this image, however, how are robotic devices and ICT integrated into the daily routines in long-term care facilities in Japan?

Based on our field visits and interviews in 2019 as well as supplementary document research, this paper discusses the potential that facility managers ascribe to robotic devices and ICT when it comes to alleviating the labor shortage in the long-term care institutions they run. We will focus on two aspects in particular: Firstly, to what extent do robotic devices and ICT contribute to making the workflow more time efficient? Based on our observations, we argue that ICT rather than robotic devices reduces the time caregivers need to invest in performing tasks such as documenting their workflow; this can potentially create more leeway to perform the actual caregiving, while mainly reducing mental stress (albeit not the physical hardship) that caregivers experience. Extending from this, secondly, we ask in how far do robotic devices and ICT alleviate the physical hardships of long-term caregiving? Our interviewees hoped to reduce the turnover rate among staff and to make the profession more attractive to potential new hires by lessening physical hardship in the workday, such as lower back pain induced by the frequent lifting of patients. Here we argue that robotic devices have some potential to reduce physical hardship, but staff are reluctant to accept them in their work routine. Even if successfully implemented, robotic devices often are not smoothly integrated in the task they support but need additional adjustments by staff. By studying the actual impact of robotic devices and ICT in long-term care facilities and the assessment of facility managers through qualitative methods, this paper takes a bottom-up perspective and thus enhances our understanding of the actual labor situation in long-term care facilities. Furthermore, it explores reasons for the gap between the development of robotic devices and ICT and their subsequent implementation into care work, thereby contributing to the research field of robotic devices and ICT in Japan's labor market.

[2]In this paper, we use the following abbreviations to refer to the content of our interviews: JAS = Japan Assistive Products Association, BEN = Benesse, CF = care facility, HEL = Helpman Japan, ORG = organization (non-profit or semi-private), POL = politician and RE = researcher.

Research design

The following subsections will lay the groundwork for our analysis by providing a literature review on the topic of robotic devices and ICT in long-term care in Japan, and a brief discussion of some of the core terminology (2.1). We will then explain our data acquisition and research approach (2.2).

Literature review and core terminology

Our study is situated at the intersection of two major research fields, i.e. long-term caregiving to an aging population, and robotic devices and ICT in the service sector, which includes caregiving. Both fields have been widely researched for the case of Japan, and while we build on these previous works, we hope to contribute new insights by introducing empirical data on the current situation of how robotic devices and ICT are utilized to contribute to alleviating the persisting labor shortage in long-term caregiving.

Japan's demographic change has drawn much scholarly attention over the years (Coulmas et al. 2008; Muramatsu and Akiyama 2011; Shirahase 2011). One of the dominant research fields in this context is social welfare, its management through policies and their economic and societal implications. Research on the introduction of Japan's long-term care insurance in 2000 has highlighted the political process of addressing the nation's increasingly mounting demographic pressure in the context of the so-called old age policies, i.e. pension, healthcare to the elderly and long-term care (Campbell 1992, 2002, 2008; Tsuji 2007). Moreover, Japan has been introduced as a distinctive case within the studies of welfare state models (Esping-Andersen 1997; Estévez-Abe 2008; Kasza 2006). Focusing on the actual task of performing eldercare work, studies on the manifold mental, physical, and economic challenges of (still oftentimes family) caregivers are a dominant strain of the research literature (Ishiguro 2018; Shire and Leimeister 2012; Suzuki, Tamakoshi, and Sakakibara 2016; Wright 2018). The introduction of the long-term care insurance made professional eldercare accessible to everybody regardless of their economic or family background, and it has triggered a norm change toward accepting caregiving performed by persons outside the realm of the family while upholding one's own quality of life (Kitamura, Adachi, and Uemura 2021; Tsutsui, Muramatsu, and Higashino 2013; Wakabayashi and Kureishi 2018). This trend contributes to the rising demand for professional caregivers beyond what can be expected from the numerical growth of the old-age population alone subsection 3.1.

In line with this growing demand for professional caregivers and an already deepening labor shortage in the sector, research on robotic devices and ICT as instruments to counteract the dire labor situation has gained popularity. While some scholars doubt that it will be feasible to advance development and disperse robotic devices in the care sector quickly enough for them to actually contribute significantly to the workflow in the near future (Borenstein and Pearson 2011; Sharkey and Sharkey 2011; Wright 2018), other studies show how robotic devices and ICT that are presently being used in the care sector already significantly improve care work (Brucksch and Schultz 2018; Braeseke et al., 2019; Shire and Leimeister

2012). Scholars seem to have reached a common understanding, though, that robotic devices and ICT will (need to) be present in the care sector of the future (Borenstein and Pearson 2011, 255; Brucksch and Schultz 2018; Choi, Kim, and Kwak 2013, 81; Braeseke et al., 2019; Johansson-Pajala et al. 2020; Kusuda 2005, 472–473; Šabanović 2014). A central open question to the debate is whether robots are bound to *replace* humans or to *support* them (Borenstein and Pearson 2011, 256; Ishiguro 2018, 266; Kusuda 2005, 475).

Next to this debate on the capabilities of robotic devices, another dominant theme in the research literature is the theme of their acceptance. Both, quantitative methods including large-n survey data (Choi, Kim, and Kwak 2013; Nomura et al. 2006, 2009), and qualitative studies (Borenstein and Pearson 2011; Brucksch and Schultz 2018; Braeseke et al., 2019; Kusuda 2005; Shi et al. 2017) aim to reveal the mechanisms of accepting a robot helper into one's life and workplace. Not only does the research literature discuss the sources of negative attitudes towards robots (Nomura et al. 2006), but it addresses attitudinal differences based on the variable of culture (Bröhl et al. 2019; Ishiguro 2018). Wagner (2013) undertakes a socio-cultural endeavor to separate the *invented tradition* of Japanese robophilia from a complex interplay of culture and technical advancement (see also Nomura et al. 2006, 2009; Robertson 2010, 12–15; Šabanović 2014, 260–261). Several studies show that the willingness to accept robotics and ICT into care work increases once they can be expected to lead to an actual workload reduction for human staff and enhance the quality of patient care (Brucksch and Schultz 2018; Ishiguro 2018; Suzuki, Tamakoshi, and Sakakibara 2016; Wright 2019; Yamamoto-Mitani et al. 2020).[3] Generally, the threshold for acceptance is relatively lower for ICT, as Sugihara et al. (2015) have demonstrated with their study on the implementation of assistive video technology in care homes. As Brucksch and Schulz show with the example of ICT-based telehealth systems in two Japanese prefectures, care receivers rarely refused to have their data processed by the system, and the Ministry of Health, Labour and Welfare (MHLW) recommends developers to use certain storage systems to prevent technical transfer problems between ICT-based systems (Brucksch and Schultz 2018, 48 and 52). Furthermore, ICT solutions as well as robotic devices for long-term care have increasingly gained coverage by Japanese mainstream media, which is no longer focused on humanoid robots. On the other hand, European and Anglo-American media still propagate the dominance of humanoid robots in the Japanese care sector (van der Veer 2018, 7–8).

As the term implies, ICT are technologies to transfer or share data and information, as well as to mediate communication (Koczula, Schulz, and Gövercin 2012, 48; van der Veer 2018, 6–7). In addition, in its online glossary, UNESCO (United Nations Educational Scientific and Cultural Organization) includes various technological tools and resources to store, exchange or create information (UNESCO 2021).[4] ICT is thus an umbrella term and robotic devices often also fall under ICT, but with an additional degree of autonomy (Nomura et al. 2006; Robertson 2010, 15; Borenstein and Pearson 2011, 259; van der Veer

[3]Regarding a successful implementation of robotic devices in everyday care work, the existing body of literature differentiates between humanoid and non-humanoid robotic devices (Choi, Kim, and Kwak 2013; Nomura et al. 2006, 2009). Borenstein and Pearson (2011, 253) point out that in care work humanoid robots evoke positive attitudes if the so-called uncanny valley (*bukimi no tani*) is avoided (see also Robertson 2020; Šabanović 2014).

[4]Examples listed by the UNESCO are, among others, computers, the Internet, live broadcasting technologies, recorded broadcasting technologies and telephony like websites, blogs, radio, television, video players, data storage devices, satellites, and video-conferencing (UNESCO, 2021).

2018, 6–7). Still, there is no common definition of robotic devices in the research literature. According to Brucksch and Schultz, robotic devices mainly differ from robots in their mobility, and technically speaking, a robot "possess[es] a central processing unit (CPU) and an actuator, which is responsible for moving and controlling a mechanical system" (Brucksch and Schultz 2018, 22). The MHLW defines a robot as an intelligent mechanical system that functions based on each of the following three basic technologies: a sensor system for sensing information (*jōhō wo kanchi* (*sensā-kei*)); an intelligence/control system for making decisions (*handan shi* (*chinō/seigo-kei*)); a driving system for operating (*dōsa suru* (*kudō-kei*)). The ministry expects care robots to reduce the workload of human workers without degrading the quality of care, thus maximizing the productivity of care work (MHLW, 2016). Subcategories of robots and robotic devices are industrial versus service, communication versus non-communication robots, humanoid versus non-humanoid robots or functional versus emotional robots. Robotic devices in care work evidently fall under the category of service (e.g. Borenstein and Pearson 2011; Kusuda 2005; Nomura et al. 2009, 2006). In our sample we only encountered functional robotic devices such as monitoring devices, robotized wheelchairs, and sensors, except for Pepper, which is a hybrid.

Data acquisition and research approach

For this study, while also considering the relevant research literature, we apply a triangulation of data. Firstly, our analysis is based on field data that we collected during a two-week study tour in the metropolitan regions of Tokyo/Yokohama and Osaka/Kyoto/Nara in January and February 2019. On that occasion, we gained insights into the day-to-day practices of health caregiving to the elderly by touring four long-term care facilities and their vicinities and interviewing the various managers of the facilities. We established contact with the care facilities following the introduction of fellow researchers in Japan and snowballing; we were looking for long-term care facilities with representatively "average" staff and resident profiles for our small sample, which would allow us to gain insights into working routines presumably widespread in Japan. In addition, while not having conducted site visits to any of the long-term care facilities run by K.K. Benesse Holdings,[5] in our interviews (BEN 01 & BEN 02, 29 January 2019) we were able to gain insights into how the Benesse Institute for Research on KAIGO manages the introduction of robotic devices and ICT. The approach pursued by a major corporation like Benesse provides an instructive contrast to our experiences in the four field visits to average-type long-term care facilities.

Both facilities that we visited in the Kanto area were in the outskirts of town, while the two facilities in the Kansai area were centrally located. Three out of the four care facilities were public, and one belonged to a religious group; all four of them would take in patients funded under Japan's long-term care insurance system. While one facility has shrunk to a small size (less than 20 in-house patients) due to a severe labor shortage in the facility, the other three that we visited were of medium size (up

[5]K.K. Benesse Holdings (*Kabushikigaisha Benesse Hōrudingusu*) is a corporation that manages facilities in the fields of children's education, life-long-learning, and caregiving to the elderly, and runs related intra-company research institutes, such as the Benesse Institute for Research on KAIGO.

to 100 in-house patients plus in some cases up to 50 day-care patients). None of the facilities were specialized in caregiving of certain patient groups. However, the three medium-sized facilities each had a ward for patients with dementia, and the smaller facility had a considerable number of patients in palliative care. Our visits to the care facilities usually ran for half a day, and would entail full tours as well as, e.g. observing musical or athletic circles or simple daily activities such as having a meal or moving to the bathroom. The semi-structured interviews and conversations with our informants on average took two hours. Our working language was Japanese. Other than robotic devices and ICT, we asked informants about general innovation, community building with the neighborhood, employment of migrant workers, and human resource management in the field of long-term care. During our interviews there was usually more than one representative of the organization present; sometimes our informants had even activated their own networks and brought in collaborating partners from other organizations as well.

Secondly, we conducted expert interviews with leading scholars in the field as well as with representatives from civil society organizations and industry spokespersons. These enabled us to gain more in-depth knowledge about their various standpoints, and in the case of scholars, to benefit from their expert perspective on the health-care sector in Japan and its potential for innovation. For reasons of confidentiality and protection of our informants, we will keep the identity of our interview partners undisclosed; only in the case of the private sector entities we decided to give the names of the companies/associations (albeit not our specific interview partners), to provide a clear context to the corporate statements.

Thirdly, we cross-referenced our empirical data with data and policy papers published by the Ministry of Health, Labor and Welfare (MHLW, 2013, 2016, 2018, 2019a), the Japan Business Federation (Keidanren 2019, 2020), and publications of some of the institutions and organizations that were included in our sample. This allowed us to give some broader context to our empirical data on usage of robotic devices and ICT in long-term care.

We thus entered the field of institutionalized health caregiving to the elderly with a focus on assessing to which degree we encounter a usage of robotic devices and ICT that substantially contributes to alleviating the manifold strains and pressures caregivers are confronted with in their daily work routines. We understand the introduction of robotic devices and ICT to professional long-term care as a countermeasure to the dire working conditions in this sector. Facility managers use this option to increase work satisfaction among staff and expect to lower the turnover rate and to be in an advantageous position when it comes to recruiting new personnel. Explicitly, they aim at easing the physical hardships of the profession on caregivers, e.g. the frequent occurrence of lower back pain, through the introduction of robotic devices, and they aim at alleviating mental stress for caregivers by making the workflow more time efficient through the introduction of ICT in, e.g. data management. Our goal is to gain a deeper understanding about the experiences facility managers have made so far when introducing robotic devices and ICT in elder-care practice. With this study we want to bolster the ongoing scholarly and political debate assessing the potential of robotic devices and ICT for Japan's labor market with insights from the actual workplace.

Robotic devices and ICT in long-term care: The context

Before introducing and discussing our own empirical data on the introduction of robotic devices and ICT in long-term care, this section will provide some background information on the labor situation in the sector and the framework of policies and private sector initiatives that shape the conditions for the introduction of new technology in long-term care in Japan.

Labor shortage in long-term care

Japan is among the world's most rapidly aging societies.[6] While the overall population in Japan continues to experience a numerical decline, i.e. negative growth (2020: −0.36%), the over-65 age bracket is the only demographic experiencing positive growth (2020: 0.77%) (NIPSSR 2020). Within the 65 years and older segment we can further identify a continuous growth of the age bracket of 75 years and above. While the share of those aged "65 to 74" and "75 and above" in 2020 is split almost equally (13.9% to 14.9%), that will change quite dramatically to 15.2% and 20.2% respectively by 2040, and to 12.9% and 25.5% by 2065 (NIPSSR, 2020), and this will translate into a larger population of potential care-recipients. For 2018, MHLW reported 6.44 million recipients under the nation's long-term care insurance (MHLW, 2018). Earlier data suggest that the risk of needing long-term care services rises by a factor of seven between the age brackets of "65 to 74" and "75 and above" (MHLW 2013). Moreover, MHLW (2018) data suggests that there might be a shift occurring in distribution between the different levels of care with a growing number of care-recipients being categorized as higher-need patients.

The Japan Institute for Labor Policy and Training (JILPT) has calculated a rising demand for the long-term care workforce in Japan of roughly 70,000 care workers per year until 2025, starting from a labor force of 1.49 million in 2012, to meet basic demands (JILPT 2015, 55–59). Given the high turn-over rate in the profession and the instable employment status of almost a quarter of the workforce in caregiving (24.4% are in nonregular employment), increasing the workforce by that large a margin seems next to impossible to achieve. 21.7% of all nonregular employees and 14.9% of the regular employees in long-term caregiving leave their jobs within the first year of employment (MHLW 2013).

In addition, caregiving in Japan is a predominantly female occupation. According to the MHLW in 2019, 73.3% of caregivers in care facilities were female, whereas the share of female home-visiting caregivers was even higher with 87.8% (MHLW, 2019b). In recent years, issues of work-life balance have entered the political discourse as female caregivers oftentimes also bear the bigger share of private caregiving tasks (Idei 2009; Nihon Kango Kyōkai 2011). While some employers implement work-life balance practices themselves,[7] substantial labor reforms so far are lacking. Additionally, the number of elderly workers who enter the profession of caregiving as a second career after initial retirement has recently become an issue of public debate, although more in the field of home-visiting

[6]Japan's total fertility rate continues to remain below replacement level (National Institute of Population and Social Security Research 2020), and net immigration to Japan is occurring on a small scale only (MHLW, 2020; MOJ 2020), while the life expectancy of Japanese remains high (NIPSSR 2020).

[7]At CF 01, the management has dedicated an employees' dorm to single mothers to provide them with affordable accommodation and to minimize their commuting time; they also run an on-site day-care center open to the children of all staff members (CF 01.01, 28 January 2019).

care rather than institutional care (JILPT 2015, 60). This trend speaks of two aspects, i.e. firstly the financial needs of elderly who cannot make ends meet on their low pension payments, and, secondly, the severe labor shortage in the sector that pushes employers to tap into hitherto unusual labor pools.

The enormity of the task of maintaining sustainable personnel development becomes even more apparent when considering the low level of job satisfaction in caregiving professions. In a 2015 survey (n = 6684) by the Care Work Foundation (CWF) among personnel in long-term care, 61.3% of the respondents claimed to be dissatisfied with their jobs. The top five reasons (with multiple answers possible) that the care workers gave to explain their job dissatisfaction point to the various hardships of the profession and the low recognition received in return (CWF 2016): low wages (57.4%); physically and mentally hard work (48.3%); low esteem in society (40.8%); difficulty to take vacation days (23.0%); instable employment situation (16.6%). Assuming that there is agreement on the policy goal to raise the number of workers in caregiving, and to achieve a higher job satisfaction and to thus reduce the turn-over rate, the profession needs to see some profound reforms, in Japan along with many other countries. For now, government agencies and business representatives in Japan have turned to robotic devices and ICT as a solution to improve the dire situation in the care labor market. The expectation is to address the point ranked second highest with 48.3% dissatisfaction among care workers, i.e. the experience of care work as physically and mentally hard work.

Policy initiatives and private sector appeals in long-term care

For several years now, the introduction of robotic devices and ICT in long-term care has been a prominent policy goal in Japan, with former Prime Minister Shinzō Abe (2006–07, 2012–20) presenting himself as a policy sponsor and the Ministry of the Economy, Trade, and Industry (METI) acting as a loyal supporter of this goal. Numerous action plans have been published by both entities, culminating in the most recent 2016–2021 Fifth Science and Technology Basic Plan that vows once again to promote robotic devices and ICT in care work (Wright 2021, 3–5). While initially opposed to the introduction of robotic devices and ICT, the MHLW, i.e. the ministry in charge of care work, has now also come to support the turn to e-medicine (Wright 2021, 8–9).[8] A 2019 policy paper by MHLW[9] calls for a substantial reform in medicine and care services, which is to be achieved by following four strategies: next to an increased use of robotic devices and ICT in health management, a general reform of workplace management becomes necessary. Furthermore, senior citizens shall be activated to participate in the turn to e-medicine, and the private sector is called upon to collaborate in this task.

The private sector, most prominently, the Japan Business Federation (Keidanren) seems eager to join in the quest for spreading robotic devices and ICT in health-caregiving in Japan. In its 2019 statement paper titled "'Society 5.0 for SDGs' – Embarking toward a new

[8]Working conditions and wage levels of staff are at the core of MHLW's concern and the source of the ministry's reluctant stance toward introducing a flexible workforce that might jeopardize these standards (such as unpaid robotic devices). For the case of introducing foreign care workers, Vogt (2018) has shown a similar reaction of MHLW, i.e. an initial opposition that turned to support only once an agreement was reached that immigrant workers would need to demonstrate the same qualifications as their Japanese coworkers and would need to be paid the same wages, too.

[9]This paper is titled "Looking ahead to the year 2040, toward the realization of a society where everyone can actively participate in good health for a longer period" (*2040-nen o tenbō shi, daremo ga yori nagaku genki ni katsuyaku dekiru shakai no jitsugen ni mukete*) (MHLW, 2019a).

era",[10] Keidanren lays out the strategy of Japan's large-scale businesses for contributing to the Sustainable Development Goals (SDGs) through an enhanced usage of robotic devices and ICT. A wave of digitalization (*dejitaru-ka no nami*) was to flow through seven business sectors in particular: top-listed is healthcare followed by agriculture, tourism, dispatch and logistics, disaster prevention, finance, and education. Regarding healthcare, Keidanren (2019) pledges to oversee actions undertaken by member companies in health technology production, and push for a reform to data management, as this is the core of next-generation health care (*jisedai herusukea*). Keidanren (2019) points to 2040, the predicted peak of population aging in Japan, as the year when medical and long-term care services need to be fully integrated in what will by then be a highly digitalized "Society 5.0".[11]

Governmental entities and Japan's large businesses today identify the spread of robotic devices and, even more so of ICT as crucial for Japan's capability to moderate the turn to e-medicine that they understand as a core component in securing high quality long-term care amidst a prevailing labor shortage. Against this backdrop of policy papers and business concepts, we approached the long-term care facilities in our sample with an explorative mindset, interested in the experiences facility managers have made so far with the introduction of robotic devices and ICT at their workplaces.

Robotic devices and ICT in long-term care: Voices from practitioners

Our informants from the care facilities chose robotic devices and ICT to counteract the actual labor shortage in care facilities, and to alleviate the physical and mental stress caused by care work. In our fieldwork we gained general insights into firstly, which devices are being used in various care facilities, and how staff members and managers of care facilities assess their usage. Secondly, we were able to gain an understanding about the process of testing and introducing new devices in care facilities. Thirdly, we were interested in what role robotic devices and ICT play in the recruitment of new staff. Through these three aspects the potential and limitations of robotic devices and ICT for improving the actual labor situation in the long-term care sector can be assessed.

Alleviating mental stress through ICT

As highlighted before, sustaining interest in and passion for care work is especially crucial to care facilities as more than two-thirds of caregivers quit their employment during the first three years on the job (unpublished material received at HEL 01, 28 January 2019). This directly relates to the persisting labor shortage in the sector. Helpman Japan[12] regularly conducts a survey on the level of job satisfaction among workers in the care service industry. The most recent publicly available back number is the *2018 Survey on the Satisfaction Level of People Employed in the Long-Term Care Service Industry* (Helpman Japan 2018).[13] In the survey, 1,500 male and female respondents between the age of 18 to

[10] *"Society 5.0 for SDGs" de aratana jidai wo kiri hiraku.*

[11] The Keidanren promotional video "20XX in Society 5.0", which kicks off with an example from the world of medicine, introduces various aspects of what a Society 5.0 in Japan could look like. Keidanren (2020, April 5). *20XX in Society 5. – Our Future created through Digital Transforamation (sic!) – (4 min.45 sec.)* [Video]. YouTube. Retrieved 24 June 2020, from https://www.youtube.com/watch?v=cWdGHWfAD1c&feature=youtu.be.

[12] Helpman Japan of Recruit Holdings is a mainly web-based recruitment service in the care sector.

[13] *Kaigo Sābisu-gyō de Hataraku Hito no Manzokudo Chōsa.*

59 were asked to assess their job satisfaction; 1,000 of the respondents were currently employed in caregiving, and another 500 were in employment elsewhere, but interested in taking up the care profession. Among those currently working in care facilities, 49.5% claimed to be satisfied or mostly satisfied with their present employment. While 49.5% is the mean of the sample, the data also shows that there is a significant (6.7%) difference in job satisfaction among employees in care facilities that have introduced robotic devices and ICT, and those that have not. Job satisfaction for care providers who work with robotic devices and ICT stands at 52.3%; for those care providers who work without robotic devices and ICT job satisfaction only amounts to 45.6% (Helpman Japan 2018). In other words, the survey results suggest that the availability of robotic devices and ICT at the workplace leads to an increased level of job satisfaction among care providers.

The survey also reveals which devices are used by the care facilities, and how satisfied care providers are with using the devices. In a majority of cases, devices and strategies that are implemented to alleviate staff shortages in care facilities fall into the category of ICT designed to make the daily work routines more efficient and less time intensive; generally, robotic devices are more often connected to alleviating the physical hardships of the profession (see subsection 4.1.2). In the 2018 survey wave, 50.8% of the respondents worked at care facilities that had introduced ICT; this is up from 46.5% in 2016. Among the most widely used ICT solutions are the following ones: an online-based program for storing patient information (29.7%), individual e-mail addresses for all employees in a care facility (20.7%), an electronic medical record of patients (19.1%), a smartphone or tablet for staff members to update patient records (18.7%), an online-based system that allows for syncing patient data between, e.g. the care facility and a hospital (16.9%), an online-based system to access and change work shift schedules (16.5%), etc. All in all, this is rather the standard program of a digitalized workplace. A little more on the extraordinary side is probably a GPS devise that enables care providers to track the location of their patients (introduced in 3.1% of care facilities). Especially for patience with dementia, the opportunity for watching pictures and videos of places one has lived or worked at (introduced in 4.7% of care facilities) might have a positive effect; the same probably goes for the opportunity to hold video-phone calls with family members (introduced in 3.1% of care facilities). Regarding the satisfaction level of care providers with the devices available, we see that it is relatively high and is consistent with almost all the ICT introduced in numerous care facilities. We see two outlier cases, where care providers obviously would like to see a much wider adoption than what is currently implemented. This concerns the individual e-mail addresses for all employees in a care facility, and an online-based system allowing staff members to communicate with each other and share information on an ad hoc basis (introduced in 13.6% of care facilities) (Helpman Japan 2018).

However, job satisfaction is not automatically guaranteed when implementing ICT at the workplace. According to representatives of the research and development team at Benesse, the company has recently introduced an electronic medical record of patients residing in their care facilities. The implementation was met with skepticism by staff members. Benesse thus applied a snowball strategy, i.e. representatives of each institution are sent to in-house centralized workshops where the new technology is being introduced. As multipliers, the representatives then return to their various facilities, where they are entrusted with training their colleagues in an "on-the-job" setting. This way, Benesse managed to increase the acceptance and usage of digital records over time. According to the company representatives, the numerous positive impacts of the digital record outweighed the time and costs initially invested into the change of the management process. Among the benefits were an increasingly smoother cooperation between various facilities as well as faster and simplified data exchange between different professions such as nurses, doctors and physiotherapists regarding the care recipient's needs (BEN 01 & BEN 03, 29 January 2019).

In addition to this, migrant care workers whose Japanese language proficiency was still somewhat limited benefited from the data input via keyboard, as typing Japanese characters is much faster and requires less active language skills than writing them by hand (BEN 02, 5 February 2019). An increased use of ICT, such as electronic patient records, can lead to a smoother integration of migrant care providers in the Japanese labor market, as the example of Benesse shows. Their experience is seconded by researchers (RE 02 & RE 03, 7 February 2019), shared by other care facilities we visited (CF 01.01; CF 02.01) and resonates with the experiences of a semi-public organization dedicated to skill development of caregivers in Yokohama (ORG 04.01). Moreover, the workload of the native Japanese-speaking caregivers also decreased since they no longer needed to correct the handwritten Japanese language notes of the migrant workers (BEN 02, 5 February 2019).

Generally, a lack of enthusiasm when it comes to incorporating robotic devices and ICT into the day-to-day caregiving is the toughest obstacle to overcome before a profound turn to more technology in eldercare could gain a foothold in Japan, as pointed out by our informant at the Japan Assistive Products Association (JASPA).[14] Although for one decade now, national-level politics in Japan have been pushing for research and development as well as for practical testing and standardization of robotic care appliances, the practical testing of appliances so far has evoked a variety of concerns among caregiving personnel and the managers of care facilities (JAS 01, 30 January 2019). There is a reluctance toward robotic devices that are meant to lessen the work burden of care personnel in both small privately-run care facilities and care facilities operating under the roof of large corporations. Firstly, a major business actor such as K.K. Benesse Holdings points to running their own research institute (Benesse Institute for Research on KAIGO), and to using their own care facilities as test sites for the implementation of new technologies and innovations. A senior representative of the research and development team explains that Benesse picks the test sites according to interest and needs of the respective care facility. Although they are a company-owned research facility and their output is meant to benefit the care personnel as well as the care recipients, Benesse researchers often encounter difficulties to get the consent of the care staff, care recipients and their relatives before introducing new devices. Moreover, regarding a long-term establishment of technical innovations, they have occasionally found it to be difficult to change established patterns in care work even when best practice examples for alternative approaches exist (BEN 01, 29 January 2019). The situation can be a little more dramatic in small care facilities, such as CF 03, located in a residential area in Kyoto. Due to severe staff shortages, this care facility had to close off one floor of their three floors designated for in-house caregiving and had to

[14]*Nihon Fukushi Yōgu/Seikatsu Shien Yōgu Kyōkai.*

discontinue their home visiting services altogether. The management of CF 03 has been trying to attract particularly young workers. However, the vice-director states that while overseeing the facility's public relations management, as a certified nurse, she does not have enough knowledge in the social media realm to successfully catch the attention of young caregiver candidates (CF 03.02, 7 February 2019).

One strategy that Helpman Japan applies to get young people interested in care work is to explicitly promote the features where care work intersects with other fields such as robotic devices and ICT, but also sports and music. This is meant to demonstrate to the prospective caregivers how diverse (and fun) the job can be. The goal is to enable candidates to find connections between care work and their individual interests and hobbies (HEL 01, 28 January 2019). A specific example for a technological gadget catering to next-generation caregivers are glasses that allow for real-time visual transmission of the actual act of care provision to a supervisor. That way, caregivers can immediately receive feedback on their performance, and subsequently enhance their skills. Our informant at Helpman Japan points out that these glasses serve as a gadget of self-improvement, much as, e.g. tracking one's daily steps via a wristband, and thus apparently have a playful element to it, which was especially attractive to younger workers (HEL 01, 28 January 2019). Yet, one could imagine that workers who have been on the job for several years would probably understand the supervision glasses not so much as a fun gadget, but as a sign of a lack of trust from their employers.

Following this idea of self-improvement, an important step for the successful recruitment of care providers is the need to imply the promise by care facilities that they will nourish candidates individually according to their strengths (HEL 01, 28 January 2019). The co-founder of an NPO dedicated to empowering caregivers stresses that at the actual workplaces this is not necessarily always the case. The NPO sets out to create networks between caregivers through offering workshops and online platforms to connect with each other. They also run multi-month training sessions designed to support skill enhancement among caregivers, and they report an outstandingly low drop-out rate from the profession of those who participated in their training (ORG 02.01, 31 January 2019). So, theirs is a success story; and so are the experiences by a semi-private organization that teamed up with a prestigious Tokyo-based university, to run programs that are dedicated to skill enhancement among international caregivers (ORG 03.01, 29 January 2019; RE 01, 29 January 2019). Another Osaka-based NPO caters to caregivers (to the elderly and to children) and community organizers and assists them in a very hands-on manner in performing their tasks, e.g. also when it comes to organizing their office work in a digitalized way (ORG 01.01 and ORG 01.02, 5 February 2019). On a more critical note, all three cases also reveal that volunteer actors apparently need to step up to support human resource development regarding (but not limited to) the use of robotic devices and ICT, since care facilities apparently do not or cannot cover this field sufficiently.

Alleviating physical hardships through robotic devices

Most devices and strategies that are designed to alleviate the physical hardships of the caregiving profession stem from the field of robotics rather than ICT. Yet, regarding their spread and the satisfaction of staff members who use robotic devices in caregiving, the picture we gained in our research is a mixed one.

Drawing again on the *2018 Survey on the Satisfaction Level of People Employed in the Long-term Care Service Industry*, conducted by Helpman Japan, 57.7% of respondents (compared to 66.0% in 2016) worked at care facilities that had introduced robotic devices. Most commonly, care facilities would supply monitoring support devices (60.8%), bathing support devices (56.7%), and indoor movement support devices (39.5%). Second to last stands the group of wearable-type transfer aid devices (14.0%), such as robotic exoskeletons. Generally, the satisfaction level of care providers with the robotic devices introduced in care facilities was reasonably high. It is particularly high regarding the transfer aid devices of wearable-type and non-wearable type (introduced in 21.1% of care facilities) (Helpman Japan 2018).

However, the feedback we heard at care facility CF 01 on robotic exoskeletons was rather disapproving. According to the facility's management, the use of their half-body robotic exoskeletons to support the lower back turned out to be impractical, mainly for two reasons. Firstly, because training the staff to put the robotic exoskeleton on and off, to move with it, and to use it properly, is a process that is overly time-consuming, and cutting into the much-needed work time in actual patient care. Secondly, even a well-trained staff member would eventually need a minimum of 30 minutes and assistance from a colleague to put on the robotic exoskeleton. Thus, it was impossible to use it in emergency situations; and even on pre-planned occasions, again, the usage was too time consuming. After initially introducing robotic exoskeletons to their facility, CF 01 decided to terminate their usage (CF 01.01, 28 January 2019). For them it was clearly an investment that did not pay off.

At care facility CF 04 they are more cautious regarding the introduction of robotic devices and ICT. There, one staff member is put in charge of keeping up with new technological devices on the care-market and to gather product information and experiences made by colleagues in other facilities before management will discuss purchasing a new device. Ultimately, it is also this person's responsibility to train their colleagues once a new device is introduced (CF 04.01 and CF 04.02, 7 February 2019). So far, they have not invested significantly in robotic devices and ICT, but rather follow a different approach. For example, they have remodeled their bathing area in line with traditional Japanese architecture (e.g. bathtubs that are short, but deep), and argue that the senior residents would be most comfortable to use these anyways. In other words, CF 04 encourages residents to take care of as many of their daily chores for as long as possible by themselves, rather than offering robotic devices, such as bathing support devices, as an "easy way out".

At care facility CF 03 we encountered another example of a mixed evaluation regarding the introduction of a robotic device to the facility. The director purchased the so-called transfer assist bed Resyone by Panasonic.[15] The innovative idea of this device is that it will

[15]Retrieved 2 March 2021, from https://www.panasonic.com/global/corporate/technology-design/ud/welfare.html.

no longer be required to lift patients from their bed into a wheelchair and back. After sliding the patient to one side of the bed, the bed itself can be split in the middle into two parts. By a simple push of a button, one part will then transform itself into a wheelchair. It turns out, however, that the surface of the bed is in fact rather slippery. If not assisted by a caregiver, in the transition phase from bed to wheelchair, patients may slide down and not come to rest in a proper sitting position. This means that caregivers will still need to perform a physically demanding task – even if not by lifting the patient, then by holding them tight and securing their sitting position. Moreover, caregivers at CF 03 have recently started to cover the surface of the bed with an extra blanket that prevents some of the sliding, but at the same time this poses a new security risk since the blanket may in fact become caught in the bed's mechanics when transforming it to a wheelchair (CF 03.01, 7 February 2019).

The director also places high hopes on the assistance of robotic devices, to free their care staff from household chores, so they can focus on care work. Hence, she purchased cleaning robots for floor vacuuming and wiping in the dining hall and the common room. Nonetheless, according to the director, the staff was and is very reluctant about the idea of incorporating the cleaning robots in their work. In fact, during their visit to the facility, the authors observed the cleaning robots in action, and could not help but think that they pose a risk to the elderly residents who may stumble over them by accident. They are quite small, move independently and their motion sensor only reacts to obstacles right in front of them. Furthermore, the cleaning robots that we observed seemed not to be capable of cleaning as thoroughly as a human hand could. The director, however, suspects that the main reason for the pronounced opposition of staff against the technologization of domestic tasks is simply due to the aging of staff. In her opinion, younger workers would be more open minded (CF 03.01, 7 February 2019).

In the realm of material innovation, we encountered a promising example that stems from an in-house research project of Benesse in collaboration with Unicharm.[16] They developed a diaper for the elderly that stays dry for up to eight hours instead of the average two hours. Used in nursing homes for the elderly, these high-tech diapers improve the comfort and hygiene of the patients and reduce lesions. They also significantly reduce the workload of the nursing staff, particularly during night shifts. The frequency of changing diapers decreases, which means that the interruptions of the residents' sleep-cycle are also decreased, and nursing staff gain more leeway to attend to other tasks. In the testing facilities, these improved diapers led to better-rested and more active residents as well as a significant workload reduction of staff (BEN 01, 29 January 2019).

Back at care facility CF 01 in Yokohama, they had a negative experience with the introduction of Pepper by Softbank Robotics.[17] Pepper is a humanoid robot that comes with a tablet attached to its chest part and is mostly used in lieu of a receptionist. CF 01, too, introduced a Pepper to the reception counter to take over easy administrative tasks, such as coordinating patients' family members to register as visitors. Due to the strong opposition of visitors, who felt alienated at the sight of Pepper, the facility decided to remove the robot. It now stands covered under a grey blanket just around the corner from

[16]Unicharm (*Yuni Chāmu*) is a Japanese company that produces hygiene-related consumer goods.
[17]Retrieved 2 March 2021, from https://www.softbankrobotics.com/emea/en.

the facility's reception area. The management of CF 01, however, is still to some degree enthusiastic about robotic devices and ICT. Already a while ago, they had introduced headsets to be worn by caregivers. These headsets prove to be useful as they allow staff to use both hands for care activities and communicate easily within the team. Also, management provides each workstation with double screens for computers, thus enabling a more efficient processing of administrative tasks. Common to both successful examples are several facts: acquisition costs are not overly steep, and there is no need for extensive staff training as the devices can be easily understood and integrated into the daily work routine. According to the facility manager, the acceptance and usage rates within the workforce are also high (CF 01.01, 28 January 2019).

Discussion of findings

Our empirical data shows that indeed the digitalization of caregiving oftentimes starts from expanding usage of data management in care facilities. The range of introduction of robotic devices and ICT, however, is extremely broad, and ranges from care facilities where a basic digital infrastructure such as individual e-mail addresses of staff members is lacking, to care facilities that have the financial and personnel capacities to introduce more advanced technologies. For smaller care facilities, the choice and introduction of new devices oftentimes entails a trial-and-error approach. We encountered examples of especially robotic devices that had proven impractical in the daily work routine and had subsequently been eliminated from usage at that facility, such as the robotic exoskeletons and the robot Pepper that are no longer being used in care facility CF 01. To avoid such purchases, CF 04 designated one staff member to keep up with developments in care technology innovation and gather information from other facilities. CF 04 was the only case that focused instead on non-technological solutions such as adjusting the height or length of furniture or home appliances. In other places, staff have adjusted devices to be able to better use them even if this compromises some of their safety features in the process; this happened, for example, when staff members covered the transfer assist bed with a less slippery extra blanket in care facility CF 03. Also, CF 03 implemented cleaning robots, but the staff is very reluctant to accept their robotic helpers. ICT solutions often proved more successful, such as with electronic patient records that not only make information sharing easier, as at the Benesse care homes, but also help foreign care staff with the input of Japanese kanji characters as highlighted by ORG 04. At CF 01, the simplest ICT solution – wireless headphones for workday communication and PCs equipped with two screens – seemed to substantially improve the efficiency of the workflow and were well-accepted by staff members.

Care facilities that operate under the umbrella of larger corporations seem to be in a favorable position since they have the financial leeway to introduce and test-run several products under the guidance of workplace mentors and external (yet intra-company) researchers. These closely-knit ties between several actors allows for a patient-centered approach to be implemented in an intertwined two-way process: bottom-up, i.e. triggered by the needs that became apparent in the daily caregiving chores; and top-down, i.e. through cutting-edge robotics and ICT that was developed by intra-company researchers. As the case of Benesse shows, such corporations make use of peer-to-peer training for new technologies which saves time and is more efficient. Oftentimes collaboration between various corporations lead to outstanding innovations such as the new Benesse/Unicharm intimate care product for bedridden elderly. Also, cooperation between other actors including organizations from the realm of civil society lead to innovative approaches in skill enhancement among the care providers, and a higher level of job satisfaction and thus a lower turn-over rate in the profession. We encountered such examples at ORG 03, which is a semi-private organization providing care and which cooperates with scholars based at a prestigious university in Tokyo who monitor their work and give hands-on advice; and also at ORG 04, which trains caregivers and has a long-standing partnership with Yokohama city administrators to cater to the needs of care facilities in the city. Using the prospect of being able to work at facilities that have robotic devices and ICT is a strategy employed by Helpman Japan and CF 03, but there are no noteworthy data to assess if the strategy works.

Conclusion

In this paper, we addressed the implementation practices concerning robotic devices and ICT of four long-term care facilities in Japan. We deemed this topic as relevant to understand the prevailing gap between the policy and industry goal to enhance robotics and ICT in elder-care in Japan, on the one hand (Keidanren 2019, 2020; MHLW 2019b), and the seemingly reluctant follow-up by elder-care facilities, on the other hand (Borenstein and Pearson 2011; Sharkey and Sharkey 2011; Wright 2018). In the analysis of our data, we focused on two questions: We wanted to know, firstly, to what extent robotic devices and ICT contribute to making the workflow more time efficient and, secondly, to what degree we encounter a usage of robotic devices and ICT that substantially contributes to alleviating the manifold strains and pressures that caregivers are confronted with in their daily work routines. Thus ultimately, we aimed to test whether the expectations of care facility managers, namely that introducing robotic devices and ICT will raise the attractiveness of working in care facilities, and thus will potentially draw more candidates to take up the care profession, are met in everyday practice. Our perspective lay with the management level of care facilities, and thus reflects their experiences with the devices at the workplace from a practitioner's angle, adding to a more comprehensive understanding of the actual labor situation in long-term care facilities.

We summarize our findings as follows: Firstly, robotic devices and ICT are on the rise in Japan's institutionalized eldercare, and facility managers generally pick up this trend. Drawing on external sources such as the Helpman Japan survey data, we can also state that a majority of care providers view the introduction of robotic devices and ICT at their workplaces positively. Currently, however, the level of usage of robotic devices and ICT in care facilities covers an extremely broad range. We can conclude that ICT rather than robotic devices reduces the time caregivers need to invest in performing tasks such as documenting their workflow; this can potentially create more leeway to perform the actual caregiving, while mainly reducing mental stress, albeit not the physical hardship of caregivers.

Secondly, we found that, as intended, robotic devices have more potential to reduce physical hardship, but staff is more reluctant to accept them in their work routine. Even if successfully implemented, robotic devices often are not smoothly integrated in the task they support but need additional adjusting by staff in contrast to ICT solutions.

We thus conclude that while in the case of large corporations, the process of testing and introducing new devices into care facilities may be institutionalized and accompanied by in-house research activities, for the numerous small care facilities in Japan, it is most often a process that is being conducted on the basis of trial-and-error. When such care facilities decide to stop using devices already introduced, such realignment of policy, of course, comes with enormous financial costs for the care facilities, and probably makes them even more hesitant when they next face a choice about whether to jump on the bandwagon of a technical innovation. Yet, robotic devices and ICT may become more central to the care work in facilities as we see a generational shift among care providers and the recipients happening, as is already hypothesized by some in the field (CF 03.02, 7 February 2019; HEL 01, 28 January 2019).

What we can take away from this research project is that the introduction of robotics and ICT in Japanese care facilities is a dynamic process which proceeds within the framework of what governmental agencies and private actors have built. This includes using data management as a starting point, initiating multi-actor collaboration, and including the care recipients' perspective.[18] Finally, we must point out, however, that our on-the-ground research also revealed huge differences regarding the capability of participating in this turn to e-medicine, with large corporations that are well equipped with specialists and financial backing now leading the way at enormous speed, and small and medium-sized neighborhood care facilities struggling to keep up with the change.

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[18]In our fieldwork we did not specifically cover the perspective of care recipients and their families, since our focus lay with the institutional side of introducing robotic devices and ICT into long-term care facilities. This is a topic for further, more comprehensive fieldwork once the pandemic situation is under control and access to care facilities becomes possible for scholars again.

Notes on contributors

Gabriele Vogt holds the Chair in Japanese Studies at Ludwig-Maximilians-Universität München (LMU Munich). Her research interests include old-age care in Japan, international labor migration within Asia, and local politics and social movements in Okinawa.

Anne-Sophie L. König is an doctoral student at Japan-Zentrum of Ludwig-Maximilians-Universität München (LMU Munich). Her research interests include demographic change, local politics and local-level elections in Japan.

ORCID

Gabriele Vogt http://orcid.org/0000-0001-8040-079X
Anne-Sophie L. König http://orcid.org/0000-0002-6554-4928

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BEN 01: Benesse Institute for Research on KAIGO, senior research scientist (2019/01/29)

BEN 02: Benesse Institute for Research on KAIGO, research scientist (2019/01/29)

BEN 03: K.K. Benesse Holdings, senior managerial position (2019/01/29)

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CF 01.01: care facility in Yokohama, senior managerial position (2019/01/28)

CF 02.01: care facility in Tokyo, senior managerial position (2019/01/29)

CF 03.01: care facility in Kyoto, director (2019/02/07)

CF 03.02: care facility in Kyoto, vice director (2019/02/07)

CF 04.01: care facility in Nara, director (2019/02/06)

CF 04.02: care facility in Nara, senior managerial position (2019/02/06)

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ORG 01.01: NPO in Osaka, caregiving, community organizer (2019/02/05)

ORG 01.02: NPO in Osaka, caregiving, community organizer (2019/02/05)

ORG 02.01: NPO in Tokyo, empowerment of caregivers, co-founder (2019/01/31)

ORG 03.01: semi-private organization in Tokyo, skill development of caregivers in collaboration with Tokyo based University, leader (partnering with CF 02) (2019/01/29)

ORG 04.01: semi-public organization in Yokohama, skill development of caregivers in collaboration with city administration (2019/01/31)

POL 01: Liberal-Democratic Party member, House of Representatives legislator (2006/02/02)

RE 01: researcher, sociology, Tokyo (2019/01/29)

RE 02: researcher, sociology, Kyoto (2019/02/07)

RE 03: researcher, nursing studies, Kyoto (2019/02/07)

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