

LEIDENASIACENTRE: AGING JAPAN

Presenting Domestic Care Technology and Elderly Care in Japanese Newspapers

Anoma P. van der Veere

LeidenAsiaCentre is an independent research centre affiliated with Leiden University and made possible by a grant from the Vaes Elias Fund. The centre focuses on academic research with direct application to society. All research projects are conducted in close cooperation with a wide variety of partners from Dutch society.

More information can be found on our website :
www.leidenasiacentre.nl

For contact or orders:
info@leidenasiacentre.nl
M. de Vrieshof 3, 2311 BZ Leiden, The Netherlands



Introduction

Japanese elderly care is in dire need of more workers, and it has been known for quite some time that the growing elderly population is placing an increasing burden on the economic mechanics of the Japanese welfare structure.¹ Government initiatives are abundant, and technological development is a central tenet of current Prime Minister Abe's policy objectives, although technological innovations can take many different shapes.² These technologies frequently differ significantly in practical functionality, and the innovations presented to readers in white papers and policy documents clearly symbolize technology as grand solutions for pressing social problems.³ Japanese print media also reflect this idealistic imagination, yet do not necessarily regurgitate the 'positive image' the government is putting forward. Hurdles such as high prices are addressed consistently when covering care technologies. Newspapers are thus at the crossroads of attempting to portray the idealism of innovation promoted in official discourse versus the practical application of technology and its market realities.

The idealistic perspective is, to an extent, echoed in English and Dutch language media. The unavoidable growth of the elderly demographic in Japan is conflated with an urgent need for innovation while technology is framed as the harbinger of advancement and progress: "Japan will have 37 million seniors by 2035 and to deal with staff shortages it is relying on robotic technology."⁴ Japanese robotics are frequently portrayed as being "healing" for care work that is described as "awkwardly intimate and physically and emotionally exhausting. Sometimes it is dangerous or disgusting."⁵ The country is consistently given as a forerunner of robotic technology in the care industry, with popular acceptance being a natural given. In contrast, non-Japanese media describe their own readership in more hostile terms, for example, as one article in the newspaper *The Times* describes: "The British think they will 'turn evil' and steal everybody's jobs. The Japanese and Americans cannot wait to be pampered by them."⁶

Whether these idealized effects of care technology are realistic in the domestic setting is largely eschewed in the media. Anecdotal evidence seems adequate to prove just how far the Japanese have come in their role as industry leader, and the assumed acceptance of robotics among the Japanese population is effortlessly connected to the inevitability of the country's aging problem: "Japan, a country that is strongly aging and loves robots, is leading this development [in domestic care technology/robotics]."⁷ After all, according to a Dutch article bearing the title "Robots with emotions help Japan forward": "The Japanese have a historical connection to it [robotics]."⁸ This is not an uncommon argument, and this particular stance is augmented by the argument that "the most innovative people in this industry are in Japan."⁹ As the article justifies: "Already in the 17th century did they have mechanical dolls called *karakuri ningyo* (emphasis added)."¹⁰ The background sketched here is exemplary of English and Dutch media outlets; equating domestic care technology in Japan with robotics. Not surprisingly, these technologies are described using overly positive adjectives such as "strong," "gentle," and "non-threatening,"¹¹ in contrast to the adjectives care work is described with ("disgusting," "exhausting," "dangerous," etc.).¹²

1) Yuzo Okamoto, "Health care for the elderly in Japan: medicine and welfare in an aging society facing a crisis in long term care," *British Medical Journal* 305:6850 (August 1992), 403.

2) See for example the many white papers focused on technology in Japan published by the Ministry of Education, Culture, Sports, Science and Technology: http://www.mext.go.jp/b_menu/hakusho/html/kagaku.htm.

3) Jennifer Robertson, *Robo Sapiens Japonicus: Robots, Gender, Family, and the Japanese Nation* (Oakland: University of California Press, 2018), 48-49.

4) Bridget Carter, "Robots do aged-care lifting," *The Australian*, 6 August 2014, Technology.

5) Louise Aronson, "The Future of Robot Caregivers," *The New York Times*, 20 July 2014, Late Edition, Opinion.

6) Will Humphries, "Lonely old age? Not with a caring robot," *The Times*, 19 October 2014, Technology.

7) Zeping Oerlemans, "Robot in 't rusthuis; Robotica / Experts verwachten dat robots in de toekomst ouderenzorg deels zullen overnemen," *Elsevier*, 14 February 2015, Kennis; Digitale Wereld.

8) Erik van Zwam, "Robot met emoties helpt Japan vooruit," *Het Parool*, 19 September 2015, Economie.

9) See for example: Dirk Draulans, "De opmars van de robot; Dreigt slimme machine mens te worden?" *Knack Magazine*, 14 January 2015, in which it is stated that: "De baanbrekers in deze discipline zitten vooral in Japan."

10) van Zwam, "Robot met emoties helpt Japan vooruit."

11) Alexandra Levit, "Thriving in the Robot Workplace," *The New York Times*, 11 September 2016, Late Edition, Money and Business.

12) Aronson, "The Future of Robot Caregivers."

Frequently reaching similar conclusions as Dutch and English-language media, research from Japanese scholars has investigated the effectiveness and benefits of domestic care technology. For example, one study explores the effect of ‘entertainment robots’ and concludes with the practical usefulness of these robots in the prevention of dementia.¹³ Arguing that the robotic dog AIBO “effectively increased patient activity” and reduces “wandering,” this study attempts to prove the benefits of this particular type of robot, also called “social robots” or “socially assistive robots.”¹⁴ I have to agree with Yuji Sone, however, when he concludes in his book *Japanese Robot Culture* that most of these studies are methodologically flawed and are designed to promote positive outcomes.¹⁵ This is also the case in the AIBO study presented above. In fact, the entire study relies on two key concepts for measurement: ‘social activity’ and ‘socialization.’ Both concepts are not defined, making the measurement itself useless. In addition, the entire conclusion is based on a four-day timeframe and a research population of thirteen persons dominated by female participants (12 female to 1 male). The timeframe is invariably too short to measure long-term effects, and the population too small and out of balance to generalize its conclusions across the population.

Yet, Japanese care technology makers are not disputing this image. In fact, some even endorse these practices with their own promotional material implying the widespread use and effectiveness of their products.¹⁶ Assisted by the government, certain companies also have their products showboated across the world in exhibitions.¹⁷ Resembling the position taken up in Dutch and English newspapers, these exhibitions are (internationally focused) strategies designed under the aegis of the Japanese government¹⁸ to promote ‘Japanese values’ while simultaneously positioning the country as a world leader in a globally competitive world.¹⁹ Whether this ideal is picked up within the domestic Japanese discourse, however, is another question. Presented in this chapter therefore is a short quantitative analysis reflecting the domestic content in Japanese print-media with regard to such technologies.

The research here offers a descriptive analysis that functions as a so-called ‘reality check,’²⁰ showing that, in fact, Japanese newspapers offer a more complex representation of domestic care technology than the biased perspective we glean from Dutch and English-language media. Although the content does frame the potential benefits of such technologies in a positive manner,²¹ domestic discourse includes obstacles such as high prices and problems with distribution and implementation. The analysis also clearly shows that it is not the health benefits of technology that are emphasized. Rather, the focus is on the market value of these technologies measured in the ability to solve larger social issues, namely the increasingly aging population, the increase in dementia patients, and the growing ‘burden’ on family, the country’s care infrastructure, and the government.

The companies developing these technologies are increasingly varied, and the various innovations they offer to the market are similarly of broad range. They span from popular robotics, such as Paro the talking seal, to devices that measure water and electricity consumption at home, also called ‘smart home technology.’²² Most of these innovations are covered in Japanese newspapers. However, placing all of them under the umbrella term ‘technology’ and drawing conclusions from this one, very broad, category makes it difficult to understand the context and their individual practical function. I

13) Toshiyo Tamura et al., “Is an Entertainment Robot Useful in the Care of Elderly People With Severe Dementia?” *The Journals of Gerontology* 59:1 (January 2004), 83-84.

14) See for example Yuji Sone’s *Japanese Robot Culture: Performance, Imagination, and Modernity*.

15) Yuji Sone, *Japanese Robot Culture: Performance, Imagination, and Modernity* (New York: Palgrave Macmillan, 2017), 193.

16) Robertson, *Robo Sapiens Japonicus*, 30.

17) See for example Pepper’s presence at the “Cool Japan” exhibit in Leiden, The Netherlands: <http://cooljapan.volkenkunde.nl/nl/robots>.

18) Koichi Iwabuchi, “Pop-culture diplomacy in Japan: soft power, nation branding and the question of ‘international cultural exchange,’” *International Journal of Cultural Policy* 21:4 (2015), 422-424.

19) Katja Valaskivi, “A brand new future? Cool Japan and the social imaginary of the branded nation,” *Japan Forum* 25:4 (2013), 499-501.

20) Roger D. Wimmer and Joseph R. Dominick, *Mass Media Research: an Introduction* (Belmont: Wadsworth, 2010), 158-159.

21) Robertson also shows that the discourse on robots, for example, “is as much, if not more, about social engineering as about nuts-and-bolts robotics.” Robertson, *Robo Sapiens Japonicus*, 62.

22) See for example: “Hirogaru ‘sumātoka’ / shuto-kan,” *Asahi Shimbun*, 26 January 2014, Tōkyō chōkan.

provide, therefore, a categorization of the technological innovations covered by Japanese newspapers in the following section.

Methodological approach

The analysis provided explores the coverage of domestic care technology in Japanese newspapers and does so by utilizing a quantitative content analysis of a pre-selected set of articles. It focuses on the major Japanese daily newspapers and their respective national, regional, and local editions. The research is part of a larger project in which a three-year timeframe was chosen to feasibly describe contemporary developments in the field. The project was themed around the aging population in Japan and the analysis is geographically limited to Japanese media. The timeframe thus follows developments over a three-year period beginning at the start of 2014 spanning until the end of December 2016.

Agreeing with Gerlinde Mautner that print media such as newspapers “very much reflect the social mainstream”,²³ the analysis makes use of the following four newspapers to describe Japanese domestic perspectives on the topic at hand: *Asahi Shimbun*, *Nihon Keizai Shimbun* (*Nikkei Shimbun*), *Sankei Shimbun*, and *Yomiuri Shimbun*. The chosen newspapers all have high-volume national distribution. Previous research has shown that readers often prefer local newspaper editions over national editions.²⁴ For this reason, the research includes local and regional editions. Nevertheless, I have chosen not to focus solely on local coverage but have included national editions into the analysis to more adequately reflect the social mainstream. Quantitatively, regional editions are less prevalent than local and national editions in Japan as regional papers are mostly concentrated in highly populated areas.

Table 1 shows the distribution articles in each of these editions used in the analysis. There is a clear bias towards national editions (73.6 percent), as these newspapers tend to cover the topics discussed in this chapter more frequently than regional (4.8 percent) and local (21.6 percent) editions. Therefore the analysis in this chapter is more reflective of the broader national discourse than of individual local discourses. The researcher was unable to gain access to the database containing the *Mainichi Shimbun*, another one of Japan’s highly distributed national newspapers. It is for this reason it has not been included in this research. Regardless, the analysis consists of a representative sample of newspapers and is therefore still an good reflection of the national discourse.

Coverage overview	Articles	Percentage
Local	27	21.6%
Regional	6	4.8%
National	92	73.6%

Table 1: Overview no. articles in local, regional, and national editions.

Using the newspapers’ separate databases, the analysis relies on a top-down approach for the collection of a specific topic oriented corpus.²⁵ The corpus was built using the Kikuzō, Nikkei Telecom, The Sankei Archives, and the Yomidasu Rekishikan databases. This initial sampling was built using thematic keywords used in developing the scope of the research: advanced age (or, elderly) (*kōrei*), home / domestic (*taku*), nursing (*kango*), technology / technological (*gijutsu*).

After sampling the data and running several frequency analyses, a list containing a selection of key terms was visualized in keyword-listings. The final list was constructed by eliminating common words (such as ‘and,’ ‘for,’ ‘to go,’ and etcetera), (page) numbers, and names (companies, persons, and authors).

The corpus used in the final analysis was built using the following keywords: nursing / care / caregiving (*kaigo*), medical care / treatment (*iryō*), nursing (*kango*), care (*kea*), recuperation / medical treatment (*ryōyō*), therapy / treatment / remedy (*ryōhō*), technology / technological (*gijutsu*), machine /

23) Gerlinde Mautner, “Analyzing Newspapers, Magazines and other Print Media,” in *Qualitative Discourse Analysis in the Social Sciences*, edited by Ruth Wodak and Michał Krzyżanowski (New York: Palgrave Macmillan), 32.

24) Hiromi Cho and Stephen Lacy, “Competition for Circulation Among Japanese National and Local Daily Newspapers,” *The Journal of Media Economics* 15:2 (2002), 87.

25) Paul Baker, *Using Corpora in Discourse Analysis* (London: Continuum, 2006), 26-9.

mechanism / instrument / apparatus (*kikai*), device / equipment / apparatus (*kiki*), assistive technology / adaptive technology / rehabilitation device (*fukushiyōgu*), and home / domestic (**taku*).²⁶

Newspaper/Year	2014	2015	2016	Total
Asahi Shimbun	457	534	457	1448
Nikkei Shimbun	22	24	29	75
Sankei Shimbun	108	112	124	344
Yomiuri Shimbun	524	672	514	1710
Total	1111	1342	1124	3577

Table 2: Overview of number of articles in preliminary data set related to keywords.

Because the corpus was still too large for a feasible analysis, finally, the data set was manually narrowed down to include only articles concerning domestic home care technology and excluding irrelevant listings, stock updates, and event information. As the research focused on elderly care, the data set was further narrowed using manual selection, limiting the corpus to articles that included the context of elderly (*kōrei*), elderly persons (*kōreisha* / *rōjin*), or aging in general (*kōreika* / *shōshikōreika*).²⁷ Articles not related to Japan, aging, and domestic care technologies were thus left out of the analysis. An overview of the final corpus per newspaper and year is given in table 3 below.

Newspaper/Year	2014	2015	2016	Total
Asahi Shimbun	9	4	16	29
Nikkei Shimbun	3	8	9	20
Sankei Shimbun	6	12	9	27
Yomiuri Shimbun	15	18	16	49
Total	33	42	50	125

Table 3: Overview of articles by newspaper/year.

Table 3 shows that the majority of articles covering domestic care technology within the scope of the described method can be attributed to *Yomiuri Shimbun* (49 articles). *Asahi Shimbun* follows with 29 articles, a significantly lower number. Although *Asahi*, *Nikkei*, and *Sankei Shimbun* are relatively balanced in quantitative terms, *Yomiuri Shimbun* clearly stands out. Nevertheless, *Asahi*, *Nikkei*, and *Sankei* together make up 66 articles and thus balance out any analytical bias. However, there is a clear indication that *Yomiuri Shimbun* covers the topic considerably more often. Exploring the reason for this is regrettably beyond the scope of this research.

The main focus of the research is to provide a descriptive exploration of newspaper content, therefore the analysis has only made use of the textual resources, and has not investigated accompanying visual material nor the physical format in which these articles have been published. The texts have been analyzed using the following two software programs: NVivo and SPSS. NVivo was used to manually create nodes for recurring topics and to conduct frequency analyses. Using these nodes, the data was coded and entered into SPSS for statistical analysis. Categorization was done as described in the methodological approach in this chapter, and below in the descriptions of topical and categorical separations.

Content units were coded in the early stage of the research, following the finalization of the corpus-building process. This was done by measuring the recurrence of topical keywords through frequency analyses. Measuring recurrent words, phrases, and title formats – syntactical units – and placing these in the broader context of the completed corpus, allows for a quantitative exploration of the

26) The term '*taku*' is taken from the Japanese written character used in the context of domestic or residential application, and is also translated as house or home.

27) I have to thank Susanne Brucksch of the Deutsches Institut für Japanstudien in Tokyo for suggesting the use of multiple keyword searches and offering an attempt at limiting the corpus to the theme of elderly care by providing an example of manual selection.

existing texts within the field.²⁸ The texts are grouped together into one data set, as they share common attributes with regard to the topic, scope, and timeframe.²⁹

Defining technology and innovation

There are several recurring concepts in this analysis that need clarification. The first is technology, and the second is innovation. Because the analysis relies heavily on popular discourse in its interpretation of domestic care technology in Japan, both definitions have to align with how they are conceived in the analyzed newspapers. Somewhat surprisingly, the popular perceptions of these two concepts align rather neatly with definitions offered by existing academic literature.

When discussing technology, the image that first comes to mind is probably some form of mechanical device involving metal, electricity, and moving parts. Although this is not necessarily untrue in most cases, this description lacks significantly in one aspect: the human actor. Technology cannot be produced or consumed without users, and in this sense it is definable by this primary function. Some scholars have already equated technology with the governance of humans in general.³⁰ Because the human aspect is clearly central to this concept, this analysis uses the definition by W. Brian Arthur, who defines technology as “a means to fulfill a human purpose.”³¹ Following this first definition, Arthur adds that technology can also be defined as an “assemblage of practices and components.”³² In Japanese these same aspects of purpose and practice are found in the word *gijitsu*: (a) technology; technical knowledge; (technical) know-how.³³ This dual definition allows a deeper understanding of the meaning of technology. However, missing from this definition is one of the central pillars in the creation of technology: innovation.

In simple words, innovation can be described as the furtherance of efficiency in the applicability of a technology, or a reaffirmation (or in Arthur’s terminology: “reclaiming”) and duplication of existing technology through representation of ‘newness.’³⁴ However, this ‘newness’ does not mean that these technologies are actually new in purpose or practice. As Robertson shows in Japan, the newness of innovation as a concept can also function to reify “conventional values.”³⁵ Instead, innovation is applicable when a technology is framed as something ‘new’, as a development or invention. In Japanese this is, for example, found in the verb *kaihatsu* (*suru*): to develop. What is clear in the definition of this concept is its wide applicability in the development of new products, industries, and functions.³⁶ Incorporated into the concept of innovation in the discourse explored in this chapter is a broad spectrum of variable forms of technology. For practical purposes this chapter places these into two manageable categories, ICT-based (IT) and mechanical technology (MT), which are explained below.

ICT-based and mechanical technology

The technology covered in this chapter are broadly divided into two main categories: mechanical technology, and ICT-based technology. There is a strong possibility of overlap herein. A robot can, for example, be mechanical in physical appearance, but is always built around software that allows it to function. Similarly, sensor technology is based on sharing information across a network, but requires a physical sensor to keep track of movements, temperature, and etcetera. It is solely for practical purposes therefore that I have separated the most commonly mentioned technologies and defined the

28) Klaus Krippendorff, *Content Analysis: An Introduction to Its Methodology* (Beverly Hills: Sage Publications, 1980), 61.

29) Following J. Deese’s theory of conceptual categories as outlined in Daniel Riffe, Stephen Lacy, Frederick G. Fico, *Analyzing Media Messages: Using Quantitative Content Analysis in Research* (Mahwah, New Jersey: Lawrence Erlbaum Associates Inc., Publishers, 2005), 61-63.

30) See for example Michel Foucault’s studies on liberalism in *The birth of biopolitics: Lectures at College de France, 1978-1979* (New York: Palgrave Macmillan, 2011).

31) W. Brian Arthur, *The Nature of Technology: What it is and how it evolves* (New York: Free Press, 2009), 28.

32) Ibid.

33) Toshiro Watanabe, Edmund R. Skrzypczak, Paul Snowden, *Kenkyūsha’s New Japanese-English Dictionary [Shin wa-ei daijiten]* 5th Edition (Tōkyō: Kenkyūsha, 2003).

34) Arthur, *The Nature of Technology*, 73.

35) Robertson, *Robo Sapiens Japonicus*, 37.

36) Toshiro Watanabe, Edmund R. Skrzypczak, Paul Snowden, *Kenkyūsha’s New Japanese-English Dictionary [Shin wa-ei daijiten]* 5th Edition (Tōkyō: Kenkyūsha, 2003), 483.

two mentioned categories based on one of two primary functions: technology built for the purpose of information processing and sharing (ICT-based technology; IT) involving two or more actors, or assistive technologies for the support of bodily activities and mental faculties that require one or two actors at the minimum (mechanical technology; MT). Following this categorization it is clear that, for example, digital patient files and sharing networks fall under the first category as it requires the sharing of patient information between multiple actors (doctor, care worker, patient, family), while robotic suits, companionship robots, or adaptable toilets fall under the second as these depend on one actor using the technology in assistance of oneself or another (patient, care worker). Logically, a single newspaper article is able to mention technology from both categories.

Nevertheless, these categories allow us to focus on the most covered technologies. Often attractive in the exploration of innovation are robots. Complete books have been written on the subject, mostly in contemplation of the role robotics will play in the future of Japanese society. Somewhat surprisingly then, following the above definition of mechanical technology (MT) (including robotics),³⁷ it becomes clear that the majority of newspapers are giving increasingly more attention to IT (see table 4).

			IT	MT
Year	2014	Count	16	16
		% within Year	48.5%	48.5%
	2015	Count	25	19
		% within Year	59.5%	45.2%
	2016	Count	36	19
		% within Year	72.0%	38.0%
Total		Count	77	54
		% Total	61.6%	43.2%

Table 4: Categorization of innovation covered by year (count and percentage).

In 2014, coverage between both categories was equal. There is a slight increase in total articles for MT in 2015 that flattens out in 2016 with the same count (19 articles). In total coverage, however, there is a decrease from 48.5 percent in 2014 to 38 percent in 2016, decreasing 9.5 percent in two years. In total the coverage of MT over all three years accounts for 43.2 percent of all articles. In contrast, IT sees a sharp increase from 2014 (48.5 percent) to 2015 (59.5 percent). In 2016 another increase shows that 72 percent of all articles mention some form of IT, showing an increase of 23.5 percent of total coverage per year. This is a noticeable upward trend.

Focusing on the individual technologies covered highlights the growing importance of IT versus MT. Popular robotics, such as the robots Paro and Pepper, have been covered extensively in academic literature.³⁸ However, together they are mentioned in only eight articles on domestic care technology over the entire three-year period, which translates to 6.4 percent of media coverage. Similarly, the robotic suit and wearable exoskeleton HAL (by Cyberdyne) is covered only seven times between 2014 and 2016 within the scope of domestic care technology.³⁹

Although it differs aesthetically from the futuristic exoskeletons produced by Cyberdyne, the RT Walker made by RT.WORKS does not lack any of the same positive publicity. In an appearance on national television channel NHK, the RT Walker is showcased as one of the ‘robots’ that will surely make life easier in the future. The name of the episode itself is “The future in which we live with robots”, and accompanied by many surprised reactions – as is characteristic of Japanese television – the RT Walker

37) The issue of defining ‘robots’ or ‘robotics’ have been explored extensively in other works and the various definitions are contested. In this work, however, robotics and robots are explored inasmuch as they are referred to as such in the content. Therefore, the analysis does not rely on a specific definition. Rather, it relies on references to the terminology as given in the content itself.

38) A simple search on Google Scholar for ‘Paro’ and ‘robot’ already gives 3,340 results.

39) Cyberdyne, <https://www.cyberdyne.jp/>.

is demonstrated by an elderly woman who in the past has broken her hip, but can now walk with the help of this ‘amazing, marvelous’ (*sugoi, subarashii*) new technology.⁴⁰

Taken together, Paro, Pepper, HAL and the RT Walker take up just 15.2 percent of total coverage of domestic care technology in newspapers. This is a comparatively high percentage within the MT category, showing that these technologies are more attractive to cover than similar ones.⁴¹ Nevertheless, as table 4 shows, there is a noticeable decline in the total coverage of MT.

In contrast, IT coverage is growing rapidly. This can be the result of a variety of factors. IT is mostly based on existing technologies, making it more cost-effective and easier to implement into real-time situations. The development of domestic surveillance technology is the most commonly covered topic, and the majority of technologies within this category deal with this issue. In Japanese this form of technological surveillance is brought into a singular concept, namely: *mimamori*. This concept consists of the two Japanese words *miru* (to see) and *mamoru* (to protect). In essence, it implies the protection of a subject by the act of seeing or keeping tabs on, implying a certain fondness for the subject,⁴² so that if a situation arises that seems abnormal to the observer, they can act in the interest of the person(s) being watched.

Mimamori, in this respect, means ‘watching over’ both in the technological sense and in the governmental sense.⁴³ Coverage of technologies dealing with this particular concept surged in 2016 (see table 5 and 6). In 2014, about 30.3 percent of coverage concerned itself with *mimamori*-technology, dipping in 2015 to 23.8 percent, but remaining stable in absolute numbers. In 2016 coverage rose significantly to 54 percent, with 27 articles. In total 37.6 percent of coverage dealt with *mimamori*-technology, exceeding Paro, Pepper, HAL and a variety of MT considerably.

Year	2014	Count	10
		% within Year	30.3%
	2015	Count	10
		% within Year	23.8%
	2016	Count	27
		% within Year	54.0%
Total		Count	47
		% Total	37.6%

Table 5: Coverage of *mimamori*-technologies (count and percentage).

			‘Smart’tech.	ICT systems	Either	Sensor tech.
Year	2014	Count	6	5	8	9
		% within Year	4.8%	4.0%	6.4%	7.2%
	2015	Count	9	7	15	12
		% within Year	7.2%	5.6%	12.0%	9.6%
	2016	Count	18	7	21	21
		% within Year	14.4%	5.6%	16.8%	16.8%
Total		Count	33	19	44	43
		% Total	26.4%	15.2%	35.2%	34.4%

Table 6: Overview of coverage of frequently covered IT innovations by year (count and percentage).

40) RT.Works “NHK sōgō terebi “sakidori” (tēma “robotto to kurasu mirai e) ni te hōsō,” *saishin jōhō*, 9 June 2016, accessed 10 January 2018, <https://www.rtworke.co.jp/information/news/35.html>.

41) Honda’s Asimo, Telenoid, Moogoo, Palro, Hello Zoomer, HSR and Meebo together make up 4%.

42) Kenkyūsha’s dictionary (5th edition) adds “fondly” to its translation of the term (“watch over”), 2508.

43) For a more complete explanation on this type of governance, see: Alex Faulkner, *Medical Technology into Healthcare and Society: A Sociology of Devices, Innovation and Governance* (New York: Palgrave Macmillan, 2009), x-xii.

IT technology can take different shapes. The most common products available fall under the categories of ‘smart’ technology, ICT systems, and general sensor technology simply referred to as *mimamori* (table 6). Although these are similar in function, ‘smart’ technology and ICT systems are mostly community-based and are conceptually centralized around the distribution of information across a network of actors that include local care workers, doctors, patients, families, and governments, as this following excerpt describes:

*Simply by placing a small sensor and a telecommunication device inside the home of an elderly person, it is possible to measure the temperature and humidity inside their rooms. Using a mobile communications network it is possible to collect data, and a company staff member can review this on their office computer.*⁴⁴

The ‘network’ aspect is introduced in order to facilitate the position of the company staff in collecting the data measured by the sensors and devices placed on location and sent to the ‘work place’. *Mimamori* sensor technology is available in a similar form, but is more prevalent in the less connected version focusing more on surveillance in the family setting:

*It is worrisome that elderly parents are living far away, however, contacting them or visiting them frequently is difficult. What is very helpful for such people is a mimamori-system for the elderly. Simply placing a specialized device in the homes of their parents, or having parents carry around a small IT device, makes it possible to check their safety. Using this, parents themselves can also make emergency calls.*⁴⁵

Interestingly, it is not the family living far away from the parents, but the parents who live far away from their children, a far cry from the ‘traditional family’ expounded in official discourse and with a clear emphasis on the importance of the children as clients.⁴⁶ The consumers of the *mimamori*-system are clearly not the elderly parents, but the children who want to “check their [the parents’] safety”. This theme is explored more elaborately below under the concept of the ‘burden’. First, however, in order to understand how this discrepancy between MT and IT coverage is developing, it is necessary to delve deeper into the topical distribution of technology within the content. The following section shows that innovations do not come about in isolation, but that they are a response to specific demands. Newspapers offer a reflection of what these demands are, and how they are (or are not) met by manufacturers.

Domestic care technology and the ‘burden’ on society

The growing elderly population is spawning several social problems. Among these, the exponential rise of dementia patients is one of the most pressing issues. Consequently, producers of domestic care technology are framing their products as the next big solution. By also reinforcing the notion that the increasing population of dementia patients is a rapidly developing problem, newspapers are aligning their content with the suggestion that the aging population is generating a gradually increasing ‘burden’ on society. To facilitate this focus, newspapers are largely disregarding health issues when covering domestic care technology, and technology in the home takes on the role of a metaphorical vehicle for solving Japan’s rapid aging problem. This is highlighted by how articles are categorized in newspapers.

Newspapers are divided into sections (or columns). These sections function as topical dividers that separate content on the basis of the primary function of an article’s subject, although there are articles that are not placed in any section resulting from their physical placement. For example: front page news is often left out of a section simply because it is on the front page, these mostly contain snippets from all different sections. Nevertheless, a newspaper section is a clear indication of an article’s main

44) “IoT de jitaku mimamori, sofutobanku nado, kōreishara muke, necchūshō, eakon enkaku sōsa, bōhan, kamera de shitsunai kanshi,” *Nikkei Sangyō Shimbun*, 2 August 2016.

45) “(Teku no seikatsu nyūmon) kōreisha o shisutemu de mimamoru sumaho de itsudemo anpi o kakunin,” *Asahi Shimbun*, 6 February 2016, chōkan.

46) See for example the invention of the ‘traditional’ three-generation family in Jordan Sand, “At Home in the Meiji Period: Inventing Japanese Domesticity,” in *Mirror of Modernity: Invented Traditions of Modern Japan*, ed. Stephen Vlastos (Berkeley: University of California Press, 1998), 192.

topic. In the case of domestic care technology, the articles are divided into the sections visible in table 7.

Section	Count	Coverage in percentage
Commercial	31	24.8%
General	33	26.4%
Education	4	3.2%
Society	31	24.8%
Health	2	1.6%
NA	24	19.2%

Table 7: Domestic care technology newspaper articles by section (count and percentage).

A few characteristics of this sectional subdivision are immediately noticeable. Firstly, the frequency in which domestic care technology occurs in the ‘Health’ section: twice. This rate of coverage (1.6 percent) over a three-year period shows that, paradoxically, health is not a central concern in the representation of care technology at home. In contrast, almost a quarter of all articles fall under ‘Commercial’ sections. It is clear that, in the case of domestic care technology, newspapers prioritize commercial interests over health; the placement of articles in mostly commercial sections highlights the economic priority of new technology.

Another aspect of coverage that the sectional differentiation, as given in table 7, shows is the placement of these technologies within the ‘General’ and ‘Society’ sections. These sections cover topics that relate to general interests (politics, security) and social interests (welfare, culture, demographics), frequently overlapping. One topic that has seen a surge in frequency is ‘dementia’ (table 8). In 2014, dementia was mentioned in 11 articles, about a third of the articles in that particular year. Two years later in 2016 the number of articles addressing dementia grew to 23, more than doubling both in absolute numbers and coverage, with almost half (46 percent) of the articles covering domestic care technology and the issue of dementia.

Year	2014	Count	11
		% within Year	33.3%
	2015	Count	13
		% within Year	30.95%
	2016	Count	23
		% within Year	46.0%
Total		Count	47
		% Total	37.6%

Table 8: Coverage of dementia in relation to domestic care technology.

Although there a variety of topics related to the aging population in Japan, the repeated connection with dementia is a discernably recurring theme:

*Dementia patients will increase to 7,000,000 in the next 25 years, and it is estimated that 1 in 5 people will be over 65 years old by then.*⁴⁷

This development is in turn connected to the need for new technology to lessen – what is increasingly described as – the ‘burden’ (*futan*) on a patient’s surroundings, families, care workers, society, and the government (table 9). One of the main benefits of domestic care technology is therefore not necessar-

47) ““Petto-robotto” shinka shinia iyasu taisetsu na sonzai ni,” *Sankei Shimbun*, 4 February 2015, Tōkyō chōkan, seikatsu, bun-ka-men.

ily the abatement of ills or the care for someone’s health, but a decrease of the burden on a patient’s surroundings:

A certain elderly dementia patient often leaves to go outside once it becomes time for dinner, wanting to go “make dinner”, forcing their care-worker to keep an eye out for the elevator and the entry hall. But giving the patient Paro just before it becomes dinnertime has prevented this behavior. Fuyōen’s facility manager, Kobayashi Akira, says that the effect is that “it sweeps away the person’s uncertainty, making it easier to put more energy into improving the quality of care.”⁴⁸

This excerpt shows that Paro’s primary function of social engagement is not its core benefit. Paro is ‘preventing’ undesirable behavior in the dementia patient in question, and thereby decreasing the burden on the described care worker. This example shows how the main consumers of new technology, such as Paro, are not necessarily the elderly themselves, but are often care facilities, nursing homes, families, and care workers. This core benefit is increasingly distilled into one of the main demands to be met in the care technology market:

The amount of people receiving medical care or nursing care at home is increasing. The nursing care burden on the family is growing heavier, and this is becoming a problem for society. Cardiovascular surgeon Kasahara Shingo (53) has created a system through which he can watch over (mimamori) elderly persons from a distance. He is trying to decrease the nursing care burden on families and establish a sense of security together with the primary nursing care worker.⁴⁹

The family is ‘burdened’ with the care for the family, and the *mimamori*-system provides the solution: decreasing the burden on the family and creating a sense of security for everyone involved. And as the first sentence emphasizes, because the population of elderly is growing, this problem is not isolated: it is a growing problem for society at large.

In this context the aging population in Japan is framed as a danger to society. In the three-year timeframe 36.8 percent of coverage mentions ‘aging society’ (table 9) either by mentioning this particular concept (*kōreika*) or by addressing the ‘declining population’ (*jinkō genshō*). Although it is easy to think it is part and parcel of the discussion on aging, the issue of ‘health’ (*kenkō*) is significantly less important than topics such as aging, the burden, and innovation (table 9).

			Aging society	Burden	Health	Development/ Innovation
Year	2014	Count	13	12	7	25
		% within Year	10.4%	9.6%	5.6%	20.0%
	2015	Count	20	16	16	23
		% within Year	16.0%	12.8%	12.8%	18.4%
	2016	Count	21	20	14	30
		% within Year	16.8%	16.0%	11.2%	24.0%
Total		Count	46	48	37	78
		% Total	36.8%	38.4%	29.6%	62.4%

Table 9: Coverage by topic and year (count and percentage).

As shown earlier, articles were explicitly placed within the Health section only on two occasions. As a topic, ‘health’ is mentioned in 37 articles, or 29.6 percent. Coverage was only 5.7 percent in 2014, and although this has doubled, health coverage is still minimal in 2016 with a little over ten percent covering the issue in relation to domestic care technology. In fact, when looking at other issues, health seems to be an afterthought in the overall quest for economic opportunities or the abatement of larger social

48) ““Seikatsu shirabe-tai” kaigo genba robotto katsuyō iyashi-gata, dōsa hojō-gata nado,” *Yomiuri Shimbun*, 15 July 2014, Tōkyō chōkan, seikatsu A.

49) Kazuhiro Nomura, “Okayama Daigaku Byōin Kasahara Shingo, shinzō kekkan gekai – kaigo mimamori, kokoro tsunagu, enpō demo” shikumi kōan,” *Nikkei Sangyō Shimbun*, 15 July 2016.

issues. Development and innovation take the lead in coverage on care technology, with 62.4 percent of total coverage within the sector. With 78 articles mentioning the development of new technology and the majority of articles placed within economic sections, the main priorities of coverage are clearly articulated. Nevertheless, there are several issues that stand in the way of providing this idealistic quick ‘technological fix’, particularly the high prices and low distribution/spread (*fukyū*) of domestic care technology, which will be covered in the next section.

More commonly associated with domestic care technology is the role the government plays. The newspapers included in the analysis all distinguish between two forms of government: national and municipal government. In total, the national government is included in 21.6 percent of all coverage on domestic care technology, while municipal governments are included in 18.4 percent of total coverage between 2014 and 2016 (table 10). Only 5.6 percent mention both forms of government. However, accumulatively 43 articles cover either form, totaling 34.4 percent of coverage. Over a third of coverage includes some form of government, a clear indication of its importance in the discourse.

			National gov.	Municipal gov.	Both	Either
Year	2014	Count	8	5	1	12
		% within Year	24.2%	15.2%	3.0%	36.4%
	2015	Count	8	13	6	15
		% within Year	19.0%	31.0%	14.3%	35.7%
	2016	Count	11	5	0	16
		% within Year	22.0%	10.0%	0.0%	32.0%
Total		Count	27	23	7	43
		% Total	21.6%	18.4%	5.6%	34.4%

Table 10: Coverage relating to governmental bodies by year (count and percentage).

The government has a large stake in the development of care technology, and has expressed this not only through extensive policy proposals and subsidizing innovation, but has even attempted to influence the mainstream discourse using popular culture.⁵⁰ From another perspective, taking the quantity of new patents as a benchmark for effectiveness in innovative collaboration, several scholars have also shown that government subsidies might be effective in the actual innovation process.⁵¹ Although this research is quite comprehensive and effective in its focus on qualitative aspects of patents, it lacks a framework for measuring the effectiveness of the actual technological developments themselves. As a result, the measurement of the effectiveness of such care technologies frequently circles back to the methodologically flawed research that *a priori* suggests the ‘benefits’ of these developments (see introduction). In similar terms, newspaper narratives include variations on the innovation versus impeding factors debate. In contrast to official discourse, however, newspapers include the difficulties companies face with distribution and implementation resulting from the high prices of their technologies.

High prices and low distribution rate of domestic care technology

Although innovation can bring with it new opportunities, there are several obstacles to overcome before a company is able to provide wide distribution of its products. Early adaption is difficult as high prices remain a hurdle for consumers. And with low adaption rates it is difficult to construct a viable distribution infrastructure. Most new domestic care technology remains experimental, and the issue of insurance coverage in a market that is seeing increasingly higher public expenditures⁵² is another

50) Jennifer Robertson explores one of these narratives, the Innovation 25 project, quite extensively in her book *Robo Sapiens Japonicus*.

51) Sébastien Lechevalier, Yukio Ikeda, and Junichi Nishimura, “The effect of participation in government consortia on the R&D productivity of firms: a case study of robot technology in Japan,” *Economics of Innovation and New Technology* 19:8 (2010), 669.

52) Florian Kohlbacher and Benjamin Rabe, “Leading the way into the future: the development of a (lead) market for care robotics in Japan,” *International Journal of Technology, Policy and Management* 15:1 (2015).

structural impediment to getting products into the market, as the following excerpt from *Nikkei Shimbun* shows:

There are still a lot of challenges for the spread of nursing care devices. One of those is the price. Although the prices are decreasing, there are still voices leaking out from within nursing care facilities asking “if prices could just be a little lower”. Meanwhile the focus on the use [of nursing care devices] in private homes is on whether nursing care insurance will cover the rental fees or buying prices of these devices.⁵³

In an August 2014 edition of the *Yomiuri Shimbun*, one university student pleaded for companies to lower their prices so that their technology may eventually decrease the burden on caregivers:

Requesting distribution of care-robots.

The implementation of care-robots for elderly and receiving support from the government is progressing. I have an interest in the caring industry, and I am researching trends. Of particular interest to me is the “Power Assist Suits” developed to assist caregivers in their work. Amplifying one’s own physical strength, these [suits] will most likely help with easing the movement of caregivers in need. It is said that the shortage of workers in the care-industry is becoming a serious problem. I am asking if the price of these robots can be lowered, so that they can be widely distributed.

University Student: Shioya Shun, 21 (Saitama Prefecture, Konosu City).⁵⁴

The university student addresses the shortage of workers as a commonly known fact, taking it as a natural given (“it is said”). The student presents technology as the most obvious solution to this problem, shown in his faith that the “implementation of care-robots for the elderly [...] is progressing” and following up with the immediate juxtaposition of the price and distribution problem of the so-called “Power Assist Suits”: “if the price can be lowered [...] they can be widely distributed.” Although the student gives no direct correlation between the physical burden on caregivers and the solution he presents in the shape of technology, he does clearly articulate awareness of the difficulties in market penetration and implementation of these expensive innovations.

This development clearly shows the shifting priorities within the domestic care market. Care-robots can be expensive and the public is aware of this, as the above excerpt clearly shows. This is an impediment for widespread distribution. Even *Paro*, one of the most celebrated care-robots in Japan, has only sold 3,500 units worldwide as of March 2016:

Paro, the seal-shaped robot that is helpful in the care for dementia patients. It has sold over 3,500 units in over 30 countries. It has even been recognized by the Guinness Book of Records as “The Most Effective Therapy Robot in the World.”⁵⁵

The “Most Effective Therapy Robot in the World” has sold 3,500 units. Looking back at the prediction that Japan will have over 7,000,000 dementia patients within the next 25 years,⁵⁶ it is an easy calculation that shows that *Paro*’s sales have not even come close to market saturation. In contrast, IT such as *mimamori*-systems can be less expensive and therefore easier to distribute. Distribution remains an issue in both categories (table 11), although this is visibly less so in the case of *mimamori*-technology.

Distribution is covered in 42.3 percent of articles on robotics, while this is true for 31.4 percent of articles covering *mimamori*. As table 11 shows, insurance is also less prevalent with *mimamori*-technology (14.3 percent), remaining an issue in 19.2 percent of robotics related articles. Although senior

53) Satoshi Yamaguchi, “Shingata kaigo shien kiki, fukyū e – robotto gijutsu o ōyō,” *Nikkei Shimbun*, 25 February 2014, yūkan, seikatsu.

54) ““Kiryū” 8-gatsu 12-nichi (tōsho),” *Yomiuri Shimbun*, 12 August 2014, Tōkyō chōkan, kiryū.

55) “Dai 8-kai ganbare!! Monozukuri Nippon kinkyū teishin shinpojiumu in Kansai (2),” *Sankei Shimbun*, 30 March 2016, Ōsaka chōkan.

56) ““Petto-robotto” shinka shinia iyasu taisetsu na sonzai ni,” *Sankei Shimbun*, 4 February 2015, Tōkyō chōkan, seikatsu, bunka-men.

households in Japan have relatively large financial assets,⁵⁷ often articulated in the content is that for commercial success in Japan one important factor still is insurance coverage. This is a likely assumption, especially with shifting household structures in which most children can no longer take on caring responsibilities.⁵⁸ However, the path towards coverage is long. Extensive clinical studies are required before acceptance into the national health insurance scheme, even clearly practical technology such as surgical robotics.⁵⁹

		Robotics	<i>Mimamori</i>
Distribution	Count	22	11
	% Total coverage	42.3%	31.4%
Insurance	Count	10	5
	% Total coverage	19.2%	14.3%

Table 11: Overview of distribution / insurance and robotics / *mimamori*.

Newspapers reflect this connection between price, insurance, and the possibility of using care technology in the domestic setting:

While the focus on usage in private homes is on whether or not nursing care insurance will cover the rental fees or buying prices of these [nursing care] devices.⁶⁰

On the one hand, consumers cannot afford the high prices of new innovations in care technology, and thus require financial assistance in terms of health insurance coverage. On the other hand, this is clearly a double-edged sword, and simply granting coverage can prove to be unpopular among those financially supporting the national insurance industry:

In our country the system in which the working generation is supporting the older generation, with their insurance premiums, is in place, but as it is now the burden on the current generation, and on top of that the next generation, it is going to be too much and this will stifle the atmosphere of free and broad-minded innovation.⁶¹

The intricacies of the national insurance system in Japan are beyond the scope of this analysis. Even so, it is important to address this dichotomy as it is presented in Japanese newspapers. Appearing under the title “*seiron*” (lit. sound argument), the President of Japan’s largest NGO (Nippon Foundation) argues that burdening the Japanese work force with rising insurance premiums “will stifle” innovation. Arguments such as this painfully expose the dilemma that captures both the consumers and the producers of innovative care technology.

Consumers cannot afford to buy innovative, but expensive, domestic care technology, especially if it is not covered by health insurance. And for producers, an over-reliance on the existing insurance system is often the only path to possible implementation, but this can, at least rhetorically, undermine innovation by increasing the overall burden on Japanese workers.

In newspapers this dilemma is given as follows: commercial interests are presented idyllically as the vanguard of social fortification by offering technology as the solution to social issues. Nevertheless they face the problems that accompany high prices and a lack of widespread distribution. At the same

57) Chikako Usui, “Japan’s Population Aging and Silver Industries,” in *The Silver Market Phenomenon: Marketing and Innovation in the Aging Society*, ed. Florian Kohlbacher and Cornelius Herstatt (Heidelberg: Springer, 2011), 327-328.

58) Richard Ronald and Allison Alexy, “Continuity and change in Japanese homes and families,” in *Home and Family in Japan: Continuity and transformation*, ed. Richard Ronald and Allison Alexy (London: Routledge, 2011), 12-13.

59) Hiroshige Nakamura et al., “Initial results of robot-assisted thoracoscopic surgery in Japan,” *General Thoracic and Cardiovascular Surgery* 62:12 (December 2014), 724.

60) Satoshi Yamaguchi, “Shingata kaigo shien kiki, fukyū e – robotto gijutsu o ōyō,” *Nikkei Shimbun*, 25 February 2014, yūkan, seikatsu.

61) Yōhei Sasakawa, “‘Seiron’ kigai o motte ‘shōrai no yume’ o katate Nippon zaidan kaichō Sasakawa Yōhei,” *Sankei Shimbun*, 16 January 2015, Tōkyō chōkan, opinion-men.

time, consumers are presented as assertively in favor of a technological solution to their problems, yet they face similar hurdles, as they cannot afford it and, like companies pursuing coverage for their products, insurance is intrinsically entangled in the increasing 'burden' on the Japanese workers that technology is actually supposed to be fixing.

Conclusion

There is no doubt that Japan's population is rapidly aging. In response, domestic care technology is being invented, developed, and promoted as a solution for the issues that this development brings with it. For example, the growing number of dementia patients is framed as an increasing threat to Japanese society as it is expected to intensify the already heavy 'burden' on families and a care industry ailing from a shortage of workers.

As a consequence, there is a growing interest in domestic care technology that is reflected in Japanese newspapers. Coverage is increasingly focused on IT, although there are still articles that remain optimistic about the possible spread of care-robots despite the large hurdles.⁶² Especially technologies for remote surveillance, *mimamori*, are expected to facilitate long-distance care and thereby decrease this ever-growing 'burden'. In contrast, although often described in celebratory terms, MT such as *Paro*, and other care robotics are challenged by their own high prices, resulting in a lack of market penetration. The actual effectiveness of such innovations is measured anecdotally, and references to how such technologies can possibly relieve the 'burden' do not negate the actual lack of distribution and implementation, however utopian these innovations might be presented.

These findings contrast the outside perspective of Japan as a frontrunner in care technology. Nevertheless, despite all of these hurdles, newspapers in Japan do actively present new technologies as the harbingers of social stability. Whether in the future this will turn out to be realistic optimism will eventually depend on the efficacy of the technology, the ability of producers to sell and distribute their products, and the willingness of consumers to adopt them.

Although there is a significant amount of studies concerning the effectiveness of domestic care technology in Japan, methodologically sound longitudinal case-studies remain largely elusive. This particular concern extends towards the incorporation of such technology within the broader discourse on the adoption of new technology. Japan is easily taken as an example of innovation, and the pleasing aesthetics that Japanese robotics offer can be seductive when examining one's own domestic innovation industries. Readers need to be very careful, however, to engage with such superficial representations of technological solutions for social problems, for simply concluding that technology will resolve any new issue will fail to address underlying structural problems. Therefore, if there is one direction in which this analysis attempts to steer its reader, it is that of incessant experimentation and confirmation. It is of utmost importance to contextualize innovations beyond their anecdotal efficacy.

62) See for example: Eiji Tamazaki and Toshihiro Kushita, "'Shinguru jidai' dokuritsu iyasu kaiwa robotto kaigo genba de mo fukyū ni kitai," *Sankei Shimbun*, 8 July 2016, Tōkyō chōkan, seikatsu, bunka-men.

References

- Aronson, Louise. "The Future of Robot Caregivers." *The New York Times*, 20 July 2014, Late Edition, Opinion.
- Arthur, W. Brian. *The Nature of Technology: What it is and how it evolves*. New York: Free Press, 2009.
- Baker, Paul. *Using Corpora in Discourse Analysis*. London: Continuum, 2006.
- Carter, Bridget. "Robots do aged-care lifting." *The Australian*, 6 August 2014. Technology.
- Cho, Hiromi, and Stephen Lacy. "Competition for Circulation Among Japanese National and Local Daily Newspapers." *The Journal of Media Economics* 15:2 (2002): 73-89. doi: 10.1207/S15327736ME1502_1. Cyberdyne. <https://www.cyberdyne.jp/>.
- "Dai 8-kai ganbare!! Monozukuri Nippon kinkyū teishin shinpojiumu in Kansai (2)." *Sankei Shimbun*, 30 March 2016. Ōsaka chōkan.
- Draulans, Dirk. "De opmars van de robot; Dreigt slimme machine mens te worden?" *Knack Magazine*, 14 January 2015.
- Faulkner, Alex. *Medical Technology into Healthcare and Society: A Sociology of Devices, Innovation and Governance*. New York: Palgrave Macmillan, 2009.
- Foucault, Michel. *The birth of biopolitics: Lectures at College de France, 1978-1979*. New York: Palgrave Macmillan, 2011.
- "Hirogaru 'sumātoka' / shuto-kan." *Asahi Shimbun*, 26 January 2014. Tōkyō chōkan.
- Humphries, Will. "Lonely old age? Not with a caring robot." *The Times*, 19 October 2014. Technology.
- "IoT de jitaku mimamori, sofutobanku nado, kōreishara muke, necchūshō, eakon enkaku sōsa, bōhan, kamera de shitsunai kanshi." *Nikkei Sangyō Shimbun*, 2 August 2016.
- Iwabuchi, Koichi. "Pop-culture diplomacy in Japan: soft power, nation branding and the question of 'international cultural exchange.'" *International Journal of Cultural Policy* 21:4 (2015): 419-432.
- "'Kiryū' 8-gatsu 12-nichi (tōsho)." *Yomiuri Shimbun*, 12 August 2014. Tōkyō chōkan, kiryū.
- Kohlbacher, Florian and Benjamin Rabe. "Leading the way into the future: the development of a (lead) market for care robotics in Japan." *International Journal of Technology, Policy and Management* 15:1 (2015).
- Krippendorff, Klaus. *Content Analysis: An Introduction to Its Methodology*. Beverly Hills: Sage Publications, 1980.
- Lechevalier, Sébastien, Yukio Ikeda, and Junichi Nishimura. "The effect of participation in government consortia on the R&D productivity of firms: a case study of robot technology in Japan." *Economics of Innovation and New Technology* 19:8 (2010): 669-692.
- Levit, Alexandra. "Thriving in the Robot Workplace." *The New York Times*, 11 September 2016. Late Edition, Money and Business.
- Mautner, Gerlinde. "Analyzing Newspapers, Magazines and other Print Media." In *Qualitative Discourse Analysis in the Social Sciences*, edited by Ruth Wodak and Michał Krzyżanowski, 30-53. New York: Palgrave Macmillan, 2008.
- Ministry of Education, Culture, Sports, Science and Technology. http://www.mext.go.jp/b_menu/hakusho/html/kagaku.htm.
- Museum Volkenkunde, "Cool Japan. Robots: Mens, machine, vriend, vijand." <http://cooljapan.volkenkunde.nl/nl/robots>.
- Nakamura, Hiroshige, Takashi Suda, Norihiko Ikeda, Morihito Okada, Hiroshi Date, Makoto Oda, and Akinori Iwasaki. "Initial results of robot-assisted thoracoscopic surgery in Japan." *General Thoracic and Cardiovascular Surgery* 62:12 (December 2014): 720-725.
- Nomura, Kazuhiro. "Okayama Daigaku Byōin Kasahara Shingo, shinzō kekkan gekai – kaigo mimamori, kokoro tsunagu, enpō demo" shikumi kōan." *Nikkei Sangyō Shimbun*, 15 July 2016.
- Oerlemans, Zeping. "Robot in 't rusthuis; Robotica / Experts verwachten dat robots in de toekomst ouderenzorg deels zullen overnemen." *Elsevier*, 14 February 2015. Kennis; Digitale Wereld.
- Okamoto, Yuzo. "Health care for the elderly in Japan: medicine and welfare in an aging society facing a crisis in long term care." *British Medical Journal* 305:6850 (August 1992): 403-405.

- ““Petto-robotto” shinka shinia iyasu taisetsu na sonzai ni.” *Sankei Shimbun*, 4 February 2015. Tōkyō chōkan, seikatsu, bunka-men.
- Riffe, Daniel, Stephen Lacy, and Frederick G. Fico. *Analyzing Media Messages: Using Quantitative Content Analysis in Research*. Mahwah, New Jersey: Lawrence Erlbaum Associates Inc., Publishers, 2005.
- Robertson, Jennifer. *Robo Sapiens Japonicus: Robots, Gender, Family, and the Japanese Nation*. Oakland: University of California Press, 2018.
- Ronald, Richard and Allison Alexy. “Continuity and change in Japanese homes and families.” In *Home and Family in Japan: Continuity and transformation*, edited by Richard Ronald and Allison Alexy, 1-24. London: Routledge, 2011.
- RT.Works. “NHK sōgō terebi “sakidori” (tēma “robotto to kurasu mirai e) nit e hōsō.” *Saishin jōhō*. 9 June 2016. Accessed 10 January 2018. <https://www.rtworke.co.jp/information/news/35.html>.
- Sand, Jordan. “At Home in the Meiji Period: Inventing Japanese Domesticity.” In *Mirror of Modernity: Invented Traditions of Modern Japan*, edited by Stephen Vlastos, 191-206. Berkeley: University of California Press, 1998.
- ““Seikatsu shirabe-tai” kaigo genba robotto katsuyō iyashi-gata, dōsa hojō-gata nado.” *Yomiuri Shimbun*, 15 July 2014. Tōkyō chōkan, seikatsu A.
- Tamazaki, Eiji, and Toshihiro Kushita. ““Shinguru jidai” dokuritsu iyasu kaiwa robotto kaigo genba de mo fukyū ni kitai.” *Sankei Shimbun*, 8 July 2016. Tōkyō chōkan, seikatsu, bunka-men.
- Tamura, Toshiyo, Satomi Yonemitsu, Akiko Itoh, Daisuke Oikawa, Akiko Kawakami, Yuji Higashi, Toshiro Fujimooto, and Kazuki Nakajima. “Is an Entertainment Robot Useful in the Care of Elderly People With Severe Dementia?” *The Journals of Gerontology* 59:1 (January 2004): 83-85.
- “(Teku no seikatsu nyūmon) kōreisha o shisutemu de mimamoru sumaho de itsudemo anpi o kakunin.” *Asahi Shimbun*, 6 February 2016. Chōkan.
- Sasakawa, Yōhei. ““Seiron” kigai o motte ‘shōrai no yume’ o katare Nippon zaidan kaichō Sasakawa Yōhei.” *Sankei Shimbun*, 16 January 2015. Tōkyō chōkan, opinion-men.
- Sone, Yuji. *Japanese Robot Culture: Performance, Imagination, and Modernity*. New York: Palgrave Macmillan, 2017.
- Usui, Chikako. “Japan’s Population Aging and Silver Industries.” In *The Silver Market Phenomenon: Marketing and Innovation in the Aging Society*, edited by Florian Kohlbacher and Cornelius Herstatt, 325-337. Heidelberg: Springer, 2011.
- Valaskivi, Katja. “A brand new future? Cool Japan and the social imaginary of the branded nation.” *Japan Forum* 25:4 (2013): 485-504.
- van Zwam, Erik. “Robot met emoties helpt Japan vooruit.” *Het Parool*, 19 September 2015. Economie.
- Watanabe, Toshirō, Edmund R. Skrzypczak, and Paul Snowden. *Kenkyūsha’s New Japanese-English Dictionary [Shin wa-ei daijiten]* 5th Edition. Tōkyō: Kenkyūsha, 2003.
- Wimmer, Roger D., and Joseph R. Dominick. *Mass Media Research: An Introduction*. Belmont: Wadsworth, 2010.
- Yamaguchi, Satoshi. “Shingata kaigo shien kiki, fukyū e – robotto gijutsu o ōyō.” *Nikkei Shimbun*, 25 February 2014. Yūkan, seikatsu.