Technology options for aged care in Japan

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Chapter 9

Potential consequences of the options

9.1 Introduction

Population ageing has been affecting many groups within Japanese society. Government figures indicate that by the year 2020, one in four people in Japan will be over the age of 65. As the number of older people and their proportion of the population continue to rise, economic and social policies to address the implications of this phenomenon have become increasingly important. In previous chapters, some of the implications of Japanese demographic trends have been discussed. One such implication discussed in Chapter 3 is that for many societal reasons it is becoming more and more difficult to rely on families to provide the necessary care in old age.

Technology is one direction in which to seek ways to ease the burden of aged care whether the burden is physical, emotional, or financial. There are different types of technology that can give the aged control over their own lives and/or give care-givers improved ways of administering care. There are also different types of technology to mitigate barriers in society to give elderly people fuller participation in society.
The notion of technological responses to socioeconomic issues was raised in previous chapters that examined aspects of the development of technology in Japan. In particular, robotics and barrier-free technology were separately considered in their overall development in Japan and their role to address the socioeconomic issues of aged care. The implications of three distinct technology options for aged care in Japan, first introduced in Chapter 1, are considered here in relation to different groups in the community.

In this chapter the potential consequences of these three proposed technology options for different groups in the Japanese community are discussed. The chapter aims to present a systematic examination of possible consequences on groups related to aged care in Japanese society when a 'technological choice' is made from the three distinct options posed in this thesis. Although choices in reality are not so clear-cut, the process of systematically listing the possible consequences from these three options illustrates the diverse implications for differing groups in society. Moreover, illustrating the diverse nature of the consequences aims to expand the argument that the process of evaluating technological choices with a sound framework is integral in developing the most beneficial policies.

It is important, however, to understand that there is no option that is best for everyone in the society. In fact, what may be a beneficial aspect of one technology option for one sector of the society may disadvantage another sector. Therefore, as discussed in Chapter 4, it is important not only for government and corporate technocrats but also for ordinary citizens in society to understand and respond to the development of technology. The
consumers’ point of view regarding different technological solutions is invaluable for the development and implementation of appropriate technology. This is particularly profound when the goal of the technology is to enhance aged care and, thus, likely to affect all individuals in Japan.

Some of the points made in this methodical and systematic analysis of the effects of each technology option may seem obvious, just common sense, however, systematically spelling out the implications provides a framework that is helpful in assessing technology development for aged care in Japan. Although the implications here focus on Japanese society, the framework can easily be applied to other societies.

In this analysis, people have been grouped under labels, such as ‘the aged’ and ‘professional care-givers’, that represent common interests in the Japanese community likely to be affected similarly. The groups selected are the aged requiring care, professional care-givers, family and volunteer care-givers, the government and public sector, the business sector, and relevant researchers. Certain aspects of aged care were selected for consideration to assist in assessing how each option might affect these groups in Japanese society, including quality, cost, convenience, flexibility, and safety issues. These aspects are reviewed separately for each option and for each group.
9.2 The consequences of Option Ones: relying on standard technology for aged care in Japan

In Option One, groups in Japan will wait for technology to become standard in other countries before importing or adapting what seems appropriate for aged care in Japan. This does not mean that technology for aged care will no longer be important but in this option, there is no Japanese investment in significant new technology for aged care. Rather, standard technology in other countries will be assessed and adopted according to the needs in Japan. However, imported technology may be refined or adapted to better suit Japanese society. It is plausible that other advanced nations will be developing new technologies for aged care as populations continue to age in these countries, too. In this age of constantly being challenged to accept new technology wherever its origin may be, it is unlikely that no further new technology will be introduced for aged care in Japan even in Option One. The option is to utilise only standardised technology developed elsewhere without initiating the development in Japan. Therefore, Option One is by no means void of new technology to assist aged care. The following section discusses the consequences of this option for each of the six groups specified earlier.

9.2.1 THE AGED REQUIRING CARE

This group consists of those who are both over the age of 65 and are also candidates to receive aged care. Aged people have experienced an enormous technological transformation in their lives as a result of the rate of new technologies appearing on the market. They have seen the birth of
technology from transistor radios, televisions, and tape cassette machines to personal computers, mobile phones, microwave ovens and remote control devices. These are just some common examples of technologies that have come into everyday life in Japan, including the area of life involving aged care.

For the group receiving aged care, Option One of simply adopting technology as it becomes standard in other countries may not result in any significant changes. Gradual incremental changes will occur in aged care in due course by adopting and implementing appropriate technologies, as they become standard in other countries rather than sudden changes from new domestic developments.

The consequences for this group adopting Option One are examined systematically using the separate dimensions introduced at the end of Section 9.1 and marked in bold lettering. For example, the quality of care which encompasses various types of care, such as medical, physical, mental, and emotional can be enhanced by possible improvements in human skill, organisational skill, empathy and so forth, regardless of technology. In this option, it is feasible that the focus for aged care in Japan may be concentrated on improving the non-technological areas of aged care.

There will be some aged people who are in a privileged position to be able to afford additional professional care or have willing family members to provide extra care; for them the absence of new technology is of little consequence. For some aged people, having no special cutting-edge
technology may mean more human interaction and they may even perceive
less new technology as enhancing the quality of care.

In relation to how Option One may affect the *cost* involved in receiving
aged care, total labour costs for care will likely increase as physical and
mental conditions of the aged tend to deteriorate over time. However, the
rise in labour costs will be partly or perhaps fully offset by reduced costs
involved in implementing new technologies to replace labour. On the other
hand, the rise in total labour costs may inflate considerably if demand
exceeds supply especially with the continuing decline in the proportion of
working age people in the Japanese population.

The *convenience* aspect of Option One for the aged is negligible except for
the fact that this option may be missing out on developing new domestic
technologies that could improve this aspect.

The *flexibility* aspect of life for the aged will continue to depend mainly on
the flexibility of the care-givers and is not particularly altered by Option
One. However, this option may mean that possible new technologies to
address the flexibility of aged care are delayed.

*Psychological* consequences have more to do with individual circumstances
rather than changes in the environment, particularly in this option where
there is minimal new technological development directly affecting the aged.
An individual's circumstance reflects relationships with family and
professional care-givers. Preference differs between individuals in the
amount of human interaction that is desired against the amount of independence that is preferred. However, there are no special psychological consequences, unique to Japan, of adopting only standard technologies, since untried technologies are not under consideration.

Other factors such as safety and user-friendliness do not apply for Option One as there are no new technologies developed in Japan to consider. Investigating the consequences in the country of origin can assess safety and user-friendliness for technologies before they are imported.

In summary, despite the probability of a rising demand for aged care as the population of the aged increases, the quality of care in Option One should remain the same for the elderly in Japan with financial resources and/or family support. Support can also come from friends and neighbours (Murakami: 2000) with a growing trend of exchanging mutual support amongst the aged themselves. However, aged people who are not as well off financially or in their ability to access family or voluntary support, may require government assistance. Overall, in Option One technology does not directly alter the quality of care in any dramatic or unexpected way. However, both the quality and quantity of care that the elderly people receive will be affected by the relative availability of human resources.

9.2.2 THE GROUP PROVIDING PROFESSIONAL AGED CARE

This group consists of people who have obtained training and qualifications to be paid as aged care-givers and include those with expertise in medical, physical, psychological, and social areas. This group, therefore, includes
people who are providing paid care services to the aged in Japan such as geriatric doctors and nurses, physiotherapists, occupational therapists, nutritionists and social workers.

Option One affects this group in minimal ways. The consequences of Option One for an individual care provider, however, depend on personal and environmental circumstances. There is no direct consequence to this group in adopting Option One. On the whole, there may be more jobs in the aged care industry as the aged population increases. Thus, Option One may create greater career prospects for professional care-givers. What may more likely affect the status of professional care providers is a change in funding their services, whether from the public or the private sector.

The quality of care should not diminish under this option unless the demand on the services of the care providers increases to the point of compromising the quality of their duties. Extra funding will entice additional care providers to impart their services and thus maintain the source for quality care when demand for services rise. With potentially more aged care jobs and career prospects, there may also be training and educational opportunities that may further improve the quality of aged care in Japan.

As far as this group is concerned, Option One in itself does not create changes in the areas of cost, convenience, or flexibility but in light of relatively fewer technology advances being introduced for aged care, there are opportunities to be creative within the standard available technology in their profession. In fact, this option can provide impetus to improve non-
technological aspects of aged care provision by professional care-givers.

The *psychological* aspect of some professional care-givers may perhaps even ameliorate in Option One. If there was an element of fear that some of their duties would be taken over by new technology, this option would help alleviate such concerns. It may even raise the profile and status of professional care-givers as the role of human care-giving will have a higher profile if no new untried technology is introduced. New cutting-edge technology is often perceived to contain elements that improve the existing level of care but sometimes at the cost of undermining the positions of human care-givers.

The issue of *safety* is not affected by technology if only well-tested technology is introduced. Neither is the *user-friendly* factor an issue in this option for this group.

The new Long Term Care Insurance system (April 2000) provides the recipients with more individual choices for their preferred type of care than in the past. Generally, however, when paid care is given, the aged tend to become passive recipients of government directed and regulated care. Rules and regulations also restrict care-givers. Moreover, new technologies may require developing more skill and know-how to use the technology and create additional stress for the care providers. Without cutting-edge or untried technologies being introduced for aged care, professional care-givers may find increasing opportunities to be creative in their work as well as finding more varied work opportunities in their profession.
9.2.3 FAMILIES AND VOLUNTEERS PROVIDING AGED CARE

People included in this category are family members of the aged and volunteer aged care-givers. There are some similar consequences as for professional care-givers if Japan opts only to rely on standard technology.

The quality of care that families provide in the absence of cutting-edge, untried technology will vary little, if at all. Neither will Option One cause change to cost, convenience, flexibility or psychological factors for those providing voluntary care to the aged. The development of no new technology will not affect safety or user-friendly issues either. However, as the volume and time span involved for providing care lengthens, the psychological equilibrium and safety levels can be endangered through physical and mental burdens placed on the care providers. Without additional aid to address these issues, the well-being of care-givers may be threatened.

Family care may be financially free to the recipients, but their family members and volunteers often provide it at a very real cost. There have been many cases of care-givers collapsing in exhaustion—'the situation is that 70-year-old children now look after 90-year-old parents, and they themselves collapse' (Oshima: 1996, 44). Therefore, those providing unpaid care to family members may be burdened further without some assistance to relieve their tasks. Moreover, the human resources required in caring for aged family are 'opportunity costs' for the society on the whole. 'Opportunity costs' here refers to the costs to society having to forgo a contribution to society when those actively participating in the paid
workforce terminate their employment in order to become care-givers to their aged family members. This can also apply to those who would be entering the workforce if they did not have aged care family obligations.

From the point of view of the family care-givers, aged care obligations can restrict and diminish the quality of their lives, especially with the longer average length of time the aged require their services. The length of time that care is needed often increases as advanced medication and treatment prolong life but do not make very old people well enough to be independent. Both the physical and psychological burdens of family care-giving are issues to be addressed, especially for care-givers who themselves are old.

9.2.4 THE GOVERNMENT / PUBLIC SECTOR GROUP

This group consists of both the national government directing social policies for the aged and the local government implementing these policies in their designated regions.

In its attempts to continue monitoring and maintaining the highest possible level of quality of care within its budget, Option One may not directly affect public provision of quality care. However, the increasing proportion of the aged requiring care in Japan’s total population may continue to deplete the workforce as more people exchange paid employment for voluntary care-giving to their aged family members as explained in Section 9.2.3. This phenomenon directly affects the running cost of the economy at large. The government will need to either provide more paid positions for aged care or aged care facilities, or both, if the economy is not to suffer
from losing workforce members with valuable training and qualifications.

The government will need to re-design infrastructure to meet aged care needs if it is not to rely on the development of new 'technofix'. This can affect the convenience and flexibility elements for the government, too. The government will be called on to provide policies to maintain economic strength whilst the provision of aged care is met without losing valuable members of the workforce. The psychological consequence on the government may be that it is pressured to be creative in finding a non-technological solution to the aged care and employment issue. Neither safety nor user-friendly aspects need investigating in depth for technologies that have been tried and have become standard in other countries. However, the user-friendly aspect of organising aged care by the government, in particular the local governments, is an area that may require additional resources as the volume of demand increases.

Until recently, the Japanese government relied on the family welfare system and families, on the whole, accepted that the obligation of caring for aged family members rested within their extended families. After the Second World War, the Japanese government used its power in directing policies of national interest over those that may directly benefit individuals in its society. These policies of national security and economic growth took priority over public welfare provision. Although the average income for Japanese households improved and Japan became economically powerful, the process involved sacrifice and hardship for many citizens. In this new millennium, there is a growing call by the citizens for the government to
address social issues that affect everyday lives of its people.

The government is aware that it can no longer rely solely on the family welfare system to adequately care for the growing population of the aged. Hence, for the government, Option One may require policy makers to re-address the issue of providing additional financial assistance and services for families experiencing ongoing responsibilities of aged care. As previously discussed, additional demands on family to give aged care can diminish the participation rate in outside paid work that directly contributes to the economy. Moreover, government tax income is likely to suffer further as more people leave their paid positions to stay home and care for the aged.

9.2.5 THE BUSINESS SECTOR

The business sector consists of companies related to aged care. By nature, companies normally aim to improve their profitability and market share. At present, there is increasing demand in the aged care industry providing business opportunities for this sector. However, under Option One, the business sector needs ways other than developing new technologies in order to gain profits in aged care related industries. The quality, cost, convenience and flexibility elements of aged care that affect the business sector in trying to run a successful business in Option One depend on possible business decisions, such as providing more skills and education training services for aged care. There are other directions for the business sector in this option that can improve these factors. They include decisions such as to increase investment in building high quality facilities for aged care, to increase utilisation of existing technologies where there are possible economies of
scale and to create further labour saving measures in areas of business other than aged care.

Option One would not directly affect psychological factors of businesses unless the business was developing technology for aged care. Businesses related to aged care would seek to develop ventures in areas other than new technologies or find other innovative ways in the aged care business to achieve their business goals. Neither the safety nor the user-friendly elements of technology itself need special consideration when only utilising standard technology. However, both elements are especially consequential in the final goods and services offered for aged care.

9.2.6 RESEARCHERS INVOLVED IN TECHNOLOGY DEVELOPMENT

This group, including academics and other researchers, would acutely feel the impact of Option One. Unlike the business sector, future commercial gains are not the overriding consideration of researchers in the academic sector and Option One would inhibit the creativity of researchers in this area. It would greatly limit their opportunities for research into new technologies for aged care and for positioning themselves at the cutting-edge of technology internationally. If being socially relevant is important for a researcher in Japan’s ageing society, the limitations on research opportunities in Option One can create adverse consequences. There is the possibility that those involved in aged care technologies may have to move to other fields unless they are prepared to redirect their focus on refining existing technology for aged care. Alternatively, Option One may offer new
opportunities to research for other socially relevant purposes.

Possible consequences of Option One on researchers do not directly affect the level of existing *quality of care*. However, refining existing technologies may improve the quality and reduce the cost. Other factors such as the *cost* involved in funding aged care technology research may be transferred to research in other areas or for additional human resources in aged care. However, transferring research funds to provide more care-giving services may only assist in solving the problem in the short term. *Convenience* and *flexibility* for researchers may be diminished by restrictions which could then create a *psychological* impact of being even partially deprived of their freedom to be creative and to be socially relevant in aged care technology research. Neither *safety* nor *user-friendly* aspects warrant consideration under this focus group.
In summary, the following table outlines the main consequences of Option One of relying on standard technology for aged care to the different groups:

**Table 9.1 Consequences of Option One**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MAIN CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aged care receivers</td>
<td>No change with the exception of possible improvements in human skills and empathy</td>
</tr>
<tr>
<td>Professional care-givers</td>
<td>More jobs and possibly greater career prospects</td>
</tr>
<tr>
<td>Family/ volunteer care-givers</td>
<td>No change but more may need to leave paid employment to care for aged family</td>
</tr>
<tr>
<td>Government/ Public sector</td>
<td>Need to address increasing demand for care-givers</td>
</tr>
<tr>
<td>Business sector</td>
<td>Possible business in training more care-givers, investing in best existing facilities, developing economies of scale for existing technologies, creating labour saving in other sectors</td>
</tr>
<tr>
<td>Researchers of technology</td>
<td>No new technology research: possible loss of positions, moves to new research areas or refining of existing technology</td>
</tr>
</tbody>
</table>

9.3 The consequences of Option Two: concentrating on developing high-level technology such as robotics for aged care in Japan

This option implies that Japan will be investing heavily in developing and promoting high-level technology, such as robotics, to address aged care issues in preference to only implementing technologies that are standard overseas or investing heavily in smaller-scale technologies, such as barrier-free technology. Option Two emphasises the Japanese commitment to cutting-edge technology, exemplified by robotics, rather than passively waiting for new technologies to become standard in other countries,
Earlier chapters described both the general development of robotics and selected examples of robots being developed to assist aged care in Japan. The term 'robotics' is used to refer to the study, research and development of this discipline and the term 'robots' to the actual machine. Researchers have demonstrated that robots can be developed to deliver aged care in diverse ways. The various types of robots will affect society differently according to their function, size, ease of use, proximity to human contact, cost and so forth. This section focuses on robotics in identifying how society is affected by Option Two, a technology option to concentrate resources on high-level technology for aged care.

9.3.1 THE AGED REQUIRING CARE

The effect of Option Two on the quality of care may vary greatly depending on the type of robots and on the care recipient's subjective perception of quality care. However, if we divide the care into medical, physical and mental care it is easier to identify possible impacts.

The quality of medical care can be improved by implementing high-level technologies. For example, robots used in certain medical procedures may provide more precision than is possible through human intervention. Waiting time for patients may also shorten if robots can assist treatment. This, in turn, may free up time for medical professionals to communicate more with their patients and enhance the overall quality of care accordingly.

Physical care that robots can provide will improve the overall quality of
Chapter 9: Potential consequences of the options

care if the recipients of this care are secure and comfortable with the particular technology in which case dignity and independence may be enhanced as robots provide a means to improve self-care.

For mental care, using robots will improve the quality of care only if the process does not isolate people from participating in society. It is not easy to imagine many aged people feeling familiar and at ease with robots in the near future. The concept of personal robots or humanoid robots may require a considerable adjustment period before they can be utilised effectively for mental care. Adjustment to unfamiliar things tends to become more difficult in older age, especially where cognitive problems begin before physical problems. It is not in the scope of this analysis to debate in depth the non-physical implications of adopting robots for aged care but this issue contains reverberating intricacies worthy of further research.

The cost of high-level, cutting-edge technology tends to be relatively high but the convenience factor of robots could offset the cost factor. In particular, by taking over dangerous or monotonous tasks, robots may improve the safety factors in aged care. Over a period of time, the savings on labour costs may also offset the cost of robots, especially as economies of scale set in. Efficacy and reliability of aged care tasks may also be enhanced by robots and as a result, labour that is saved can be channelled to other areas of need in the economy. Furthermore, robots may enhance flexibility for the aged if their services were more readily available than human care. On the other hand, as robots (in their present stage of development) tend to take up physical space and are usually not easily
portable, the sheer size may impede convenience and flexibility. Robots, however, can potentially offer more flexibility in choosing the source of care especially for those who value independence and abhor being a burden to other people.

The above issue of robots providing care is closely related to the psychological significance of robots. For some, the provision of aged care from a robot in place of humans conjures the fear of being a nuisance and is demeaning. Yet for others, not having to rely solely on other people may reduce their sense of imprisonment and helplessness. Therefore, depending on the operational functions of the robot and the personal environment of the aged, introducing robots has the potential to release some aged people from a negative psychological burden. Whatever merits robots may display, the safety aspect is the most crucial for the users. Without assurance of safety, any good outcome will be negated. Moreover, if robots cannot be user-friendly, there is little hope of aged people understanding and accepting complex procedures for something unfamiliar and new, even with enticing benefits attached.

As the Aid-1 case study in Chapter 5 demonstrated, the elderly population is likely to feel anxiety, if not fear, coming in close contact with an unfamiliar, large apparatus. It is therefore reasonable that implementation of robots that come in close contact with human beings, especially frail or ill people, requires even more stringent testing than for the industrial robots. Even with assurance of safety for using robots, the present elderly population in Japan is accustomed more to human care, particularly from family, than that
provided by any sophisticated machines. Moreover, an element of reluctance still remains for the majority of the aged population in exposing their needs and accepting care from outside the home. This mode of thinking will likely change as the modern trend of 'individualism' and 'independence' spreads and people begin to take more responsibility for their own well-being and as family care becomes less accessible.

For those who have experienced the high speed of technological changes in the last decade as a fairly young person, the operation of and the interaction with a personal robot may be less disturbing than for the older cohorts. Younger people may feel little resistance to integrating robots into their lives. Despite a number of concerns still remaining, utilising robots for selected functions in aged care as an option seems to hold distinct merits and, as such, some may even actively seek care offered by robots in preference to relying on other people.

In future, devices that ensure continuing independence in old age are likely to become more accepted. Factors such as the cost and safety of using robots are particularly crucial before implementation despite the possibility that the care given by robots will ensure increasing consistency of quality as well as convenience. If people become convinced that using robots will diminish their need to rely on other people for at least some aspects of care, this can be a powerful motivation in accepting robots as a technological solution in prolonging independence as people age and become physically weaker.
It can also be argued that aged people will appreciate human contacts more if they could be used for conversation and interaction rather than to merely receive physical help when robots can perform these physical tasks. On the other hand, some aged people may choose to rely totally on robotic care with little human contact resulting in social isolation. Worst still, some aged people may be abandoned by people if robots can provide the necessary physical care and for them, there would be little choice but to rely only on robots for aged care (King: 1997). These are important issues even if such a scenario is not likely for many years to come. As with most new technologies, there are choices on how the technology is utilised and society needs to ensure protection for the users so that robots do not endanger lives. As discussed in Chapter 4, the role of consumers in expressing their views for technology development for aged care is, thus, crucial.

9.3.2 PROFESSIONALS PROVIDING AGED CARE

The effects of opting to promote high-level technology like robotics on those who are professional care-givers keen to improve the quality of care can be complex. On the one hand, the technology may enhance the total quantity and quality of care that professionals can provide. On the other hand, professional care-givers may not welcome feeling that they are being replaced by robots or even losing control of the care they provide. Should robots be utilised to replace some care-givers in this group, this may lead to loss of jobs. Another unwelcome possible consequence may be for the status of professionals to decline were they to become more like 'machine minders' than providers of expert care.
It is also possible that new skills will be expected of professional aged care-givers in handling robots. There are some apparatuses, like the 'human lifter', which aids the physical protection of the care-givers and may ease their tasks without compromising the quality of care. It would depend on the functions of the robots whether the care-givers’ role and status would improve or diminish but it can be argued that assistance from robots holds possibilities of improving the quality of care and the volume of work that can be accomplished.

In essence, the quality of care can be improved by robots that support and enhance the work of professionals. However, both patients and professional care-givers need to feel comfortable and confident using the particular technology. In the long run, it may be possible to reduce the relative cost of professional aged care by utilising robots but sufficient adjustment time is required for any teething problems to be sorted out and for economies of scale to set in. Both convenience and flexibility factors may be positive if robots allow care-givers to be more flexible in allocating their time and expertise. Robots may also provide more opportunities for the care-giver to communicate and interact with their patients and thus, have a positive psychological impact. If robots ease the physical demand on the care-givers, both the psychological and the safety aspects will improve for the care-givers. However, there are other safety issues and legal implications should the robots break down or become dysfunctional and the degree of user-friendliness will also profoundly influence the acceptability of this type of high-level technology for aged care.
9.3.3 FAMILIES AND VOLUNTEERS PROVIDING AGED CARE

The consequences of concentrating on developing robotics for aged care from the families’ point of view can also vary considerably from case to case. The situation that numbers of available family care-givers are gradually but inevitably declining in relation to the increasing numbers of aged people in the society is real. For family care providers, assistance from robots may make the difference between the ability to sustain care at home and being forced to commit their aged family member to a nursing home. There have been increasing cases of family care-givers collapsing from total exhaustion due to incessant demands of aged care. The care-givers who grow up accustomed to high-level technology are apt to accept, adapt and take advantage of devices that allow them some quality of life whilst taking responsibilities for the care of their aged family members at home. This is particularly relevant in cases where the aged or their families are reluctant to accept outside human support.

As in the last section, the cost and safety issues will affect the acceptability of robots. For instance, families that are financially unable to provide the newer, more sophisticated technology may feel guilty. Alternatively, the status for human care-giving may decline if robots becomes perceived to provide better aged care than volunteers. In some cases, the implementation of robots into family life may be disruptive even by the sheer size of the robot. Care-givers may need to acquire new skills to utilise the robot which can also be a source of stress. However, if robots can be utilised conveniently and provide release from some of the burdens of care-giving, this could lead to more quality human interaction between the family
members giving and receiving care. In the case that, one day, robots become sophisticated enough to replace care-givers, there is the potential danger that the aged could be left totally in isolation from humans. This is not dissimilar to substituting television or computer games for child minding. Unless appropriate measures are taken, there is always the risk of undesirable uses of technology in ways not intended by their designers.

The quality of care that family members provide can be improved if the technology fits well into the environment and eases the burden of the care-givers. For instance, rather than having to rely on additional outside helpers, robots may be able to meet the need whilst protecting family privacy. However, implementing robots may be relatively very costly compared to obtaining additional human care from outside the home. This cost factor is likely to be significantly higher for the newer cutting-edge technology. The consequences of the convenience and flexibility aspects are the same as in the case of professional care-givers. The psychological effect would vary greatly depending on the care-giver’s family relationships and the availability of support as well as the degree of familiarity with robots. These variables could determine whether robots might greatly enhance the life of the care-giver or whether they might add more stress to the care-giver. In terms of both safety and user-friendly aspects, the better they are, the higher the probability that other factors will have positive outcomes.

9.3.4 THE GOVERNMENT / PUBLIC SECTOR

For the government, the main financier of aged care, any measures to improve the quality of care and cut costs are options well worth considering.
for implementation. Therefore, utilising high-level technology is attractive if it is economically viable and if helps to meet the expanding demand for aged care without depleting the labour force in other areas. In Option Two, there is likely to be a substantial policy apparatus established with vested interests in high-level technology. The positive aspect of this is that government funding and backing will impose little threat of financial risk taking. Moreover, the development may create spin offs for other economic advantages. However, the direction of the development will be controlled by government bodies with their own agendas that will not necessarily correspond with the concerns of the users. Controlling the safety and quality aspects will be a seriously important issue for the government. However, the Japanese government is also acutely aware of potential business advantages that enhance economic output. Simultaneously, the government is likely to see that maintaining the cutting-edge into new technological advancement provides further advantages for the economy. Leading the world in areas of technology has been an important goal for the government since the Second World War.

Because the government is eager to be acknowledged as maintaining or improving the quality of care, then it is worth pursuing Option Two if developing and utilising robots will achieve this. This option is especially attractive for the government if the cost of aged care can be restrained. However, even if using robots could cut the cost of care-giving, the government may incur additional cost in regulating robots. Furthermore, under Option Two, public funds may be required, especially in the initial stages, to develop, promote and diffuse robots into the community. Robots
has the potential to add *convenience* and *flexibility* in government’s care management.

If the government can persuade the public that by pursuing Option Two, the government is committing itself to furthering compassionate care, there will be a positive *psychological* impact for the government. Both *safety* and *user-friendly* aspects will play a vital role in influencing the public acceptability of this option. It will be the responsibility of the government to set guidelines ensuring the safety of utilising robots for aged care. There will also be educational and legal issues for the government to address. The potential threat of liability is a major issue and its implication can be costly not only financially but also in terms of human resources. Whilst robotics technology might free people of repetitive, boring or dangerous tasks, robots themselves may be dangerous if they malfunction. After all, they are mere machines. The first robot-induced fatality in Japan, in July 1981, was widely reported in December of the same year (Schodt: 1988, 164). Who is responsible and how are people to be compensated for robot-induced accidents? This is particularly a sensitive issue in respect of aged care robots compared to industrial robots.

Government needs to take into account that as an increasing proportion of its electorate become aged, meeting the demands and expectations of this group becomes a vital agenda for survival. The aged group is not only expanding in size but the number of people in the group who hold positions of authority in all areas of society are also increasing. It can therefore be expected that well educated and articulate people within this group will
increasingly voice their views publicly in order to exert pressure on future
government policies. If using robots becomes acceptable and increasingly
preferable among the aged, the government may face escalated costs
relating to robots for aged care.

9.3.5. THE BUSINESS SECTOR

The normal goal of a business is profit making and if Option Two can
provide the means for businesses to expand and increase their profits, this
option is attractive to the business sector. Moreover, if the government
endorses this option, there are likely to be assured customers for this group.
Potentially big, profitable business implies new markets that drive
investment and therefore, there may be a strong vested interest in pursuing
Option Two by this group. Such vested interest imposes pressure on
government for support, endorsement, subsidies, and possibly insurance
against safety problems. However, the business sector would likely only
prosper in the long-term if robots really improve the quality of care and
appropriately meet consumer demands.

Competition between companies providing robots is based on both the
quality and the cost factors. Because robots are relatively expensive and
require longer to develop than other aged care products, the cost efficiency
factor may inhibit some businesses from participating in producing and
marketing robots. In order to utilise economies of scale, it is probable that
ultimately only the most cost efficient businesses would survive. The impact
on the business sector regarding the convenience and the flexibility of
Option Two also relate to robots being relatively big and expensive to
display and carry as stock. Therefore, this option may not provide more convenience or flexibility to businesses.

9.3.6. RESEARCHERS INVOLVED IN TECHNOLOGY DEVELOPMENT

Researching high-level technology such as robotics for aged care, which has potential for development in vast areas, is challenging. Academic research by nature pushes the boundaries of the unknown with a hope that the results might somehow benefit the society in the long run. Academic and research careers are enhanced by successful research. Therefore, robotics researchers in the academic world would welcome financial and other encouragement to forge ahead in an interesting area which also has the potential to serve society. This would provide opportunities not only to be socially relevant but also to raise their status both domestically and internationally. Moreover, as other countries seek to cope with the added demands of an aged society, new research outcomes can have international benefit as Japanese research scientists and engineers share their knowledge in the global arena.

Research outcomes from Option Two endeavour to raise the level of the quality of care and lower the overall cost in the long-term management of aged care. The new technologies would also aim to enhance the convenience and flexibility factors of caring and would provide paths for further research. Opportunities to pursue challenging research that is socially relevant would have a very positive psychological impact for those researchers involved. In order to be successful, researchers need to
concentrate on ensuring a positive impact for the safety and user-friendly aspects of their research.

In summary, the following table outlines the main consequences to different groups with Option Two of concentrating on developing high-level technology for aged care.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MAIN CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aged/care receivers</td>
<td>Possibly enhance independence or increase isolation; complex adjustment to using robots</td>
</tr>
<tr>
<td>Professional care-givers</td>
<td>Possibly enhance task but may result in loss of jobs; may require new skills; may change status</td>
</tr>
<tr>
<td>Family/volunteer care-givers</td>
<td>As above with extra possibility of guilt if unable to afford robots</td>
</tr>
<tr>
<td>Government/public sector</td>
<td>Need to address regulation, liability, subsidy issues</td>
</tr>
<tr>
<td>Business sector</td>
<td>Possible business expansion opportunities; new market opportunities both domestically and internationally</td>
</tr>
<tr>
<td>Researchers of technology</td>
<td>Exciting cutting-edge technology research opportunities to raise research profile and status</td>
</tr>
</tbody>
</table>

9.4 The consequences of Option Three: concentrating on developing smaller-scale technology such as barrier-free technology for aged care

Earlier chapters describing the development of barrier-free and assistive technology demonstrated how relatively quickly and cheaply some aged care devices using barrier-free technology are developed. This smaller-scaled technology is not as physically or financially daunting as robotics.
Some of the examples already discussed include simple everyday goods like shampoo and conditioner containers that can be distinguished just by touching. Some gadgets like doorbells with lights require additional technology but these are still relatively simple compared to robotics technology.

The terms ‘assistive technology’, ‘barrier-free technology’, and ‘universal design’ suggest the aim of developing devices using smaller-scaled technology. For all users, the aged and the care-giver alike, the devices created with barrier-free technology are readily and easily accessible and useable. This technology option aims to remove ‘barriers’ that prevent the aged and the disabled from participating in their societies because of physical disabilities or frailties. Moreover, ‘universal design’ aims to utilise technology in order to incorporate the needs of people with varying abilities with the outcome being useful to a wide range of consumers. Thus, barrier-free technology significantly assists in aged care even if the technology used is smaller-scaled than the likes of robotics.

Being a smaller-scaled technology, there is a relatively narrower gap in understanding the nature of this technology between those with expert knowledge and ordinary citizens. There are many cases where non-professional innovators and others with such interests have volunteered their services by forming groups to develop and promote ‘useful’, ‘handy’ devices. The E & C Project described in Chapter 8 is one such example. The normal procedure of development is that needs are taken up by engineers or technologists to create or modify goods and services for a more convenient
or safer or more flexible use. By their experiences, the aged people can
directly put forward their difficulties to those with expertise so that solutions
can be sought by developing this mode of technology. The care-givers, too,
can express any difficulties they encounter in their tasks.

9.4.1. THE AGED

Option Three affects the aged by developing technology that modifies
existing products or creates useful devices relatively quickly and cheaply
compared to the technology in Option Two. Smaller need not be inferior and
can have a profoundly positive impact on the quality of care. This is
because, whether it is in the area of medical care or physical care or
mental care, the end products are created in a relatively short time at a
relatively modest cost and often in conjunction with the users' input. The
cost of developing such goods is relatively low and therefore accessing
these devices or goods is relatively easy. Often the convenience and the
flexibility factors affecting the aged are greatly enhanced by Option Three
products that are need-driven. Moreover, the psychological effect on the
aged tends to be very positive as users have practical needs met relatively
quickly and cheaply. In addition, because the aged are themselves often
providing input in Option Three, there is a sense of ownership and perhaps
keenness or responsibility to see the barrier-free products used. The aim of
the barrier-free type technology promoted in Option Three is to create a
society where goods and services are as safe and as user-friendly to as
many people as possible regardless of their age and physical or mental
abilities. In regards to aged care, practical needs of the aged with physical
disabilities or frailties are directly addressed in developing technology for
Option Three.

9.4.2. PROFESSIONALS PROVIDING AGED CARE

People who are paid to care for the aged will have increased opportunities to improve the quality of care they provide in Option Three by simple modification of their equipment or tools. The cost factor is relatively small and potentially enhances both convenience and flexibility of their professional tasks. There is an element of psychological boost to care-givers when small modifications can raise the level of their work performance or make their tasks easier. Moreover, the opportunities for this group to be part of the development process encourages sharing the drive for successful outcomes. The safety and user-friendly factors for this group in relation to aged care can be addressed by communicating with those responsible for developing the particular technology and producing the goods or services. This process is relatively easier in Option Three because modifying smaller technology tends to be simpler than for high-level technology. The success of the final outcome depends on the needs being explained clearly.

The social consequences of deriving solutions to aged care problems are positive for this group, too, as the scope and demand for work in aged care are unlikely to diminish for decades. Moreover, in developing barrier-free technology to ease or solve a particular aged care related problem, part of the aim is to share the result for the benefit of other members of the society as well as the aged. Such examples were presented in Chapter 8 and clearly demonstrated this point. Over time, the concept of barrier-free technology has evolved so that normal products and buildings are incorporating designs
to address as many needs as possible to enable easier access for all. This concept of design produces ‘universal design’ products and houses directed at being universally user-friendly.

9.4.3. FAMILIES AND VOLUNTEERS PROVIDING AGED CARE
The way in which Option Three affects this group is very much like those in the above groups. The technology may be simple but the gadget or home modification using barrier-free technology can greatly enhance the quality of care without incurring prohibitive cost. Moreover, the added convenience, flexibility, and safety aspects often ease the workload of the family care-givers and enhance the quality of life for them. This produces a psychological boost and increases possibilities for this group and for the care recipients in having more quality time to interact. Option Three is likely to provide outcomes that reduce physical burdens to family care-givers and allow them more opportunities to pursue outside interests and prevent social isolation. Because the end products of Option Three are relatively simple and smaller-scale, they are likely to be user-friendly and not intrusive into space used for other things in the home. All of the above merits are particularly helpful to older aged couples trying to remain together by mitigating the burden of mutual care and to the increasing elderly population wishing to maintain independence.

9.4.4. THE GOVERNMENT / PUBLIC SECTOR
The government welcomes policies to improve the quality of care if that is achievable in a cost-effective manner. It is certainly convenient for the government if Option Three eases the burden on care-givers and lengthens
the time before people need intensive or formal aged care. Moreover, the
government may be able to incorporate more flexibility in the way
professional care-givers are utilised if Option Three produces means for the
care-givers’ tasks to be achieved less strenuously and in less time. Because
the aim of Option Three is to develop technology that will break down
physical barriers in society, it is mandatory that the end results are user-
friendly. However, maintaining certain levels of quality and safety standards
are likely to come under government jurisdiction. One would envisage that
the provision of safety standards for barrier-free technology goods and
services is not very different from standards governing ordinary goods and
services. Thus, Option Three is not likely to necessitate major changes in
government policies.

The government earns approval for raising the domestic level of quality of
life. It may determine that this is attainable economically by promoting
barrier-free technology. The outcomes not only directly benefit a larger
section of the community but also create opportunities for businesses and
for employment. Moreover, there is an additional bonus for the government
whenever new devices enable people to extend their independence and
therefore relieve the government of the additional burden of providing
assistance and care.

9.4.5. THE BUSINESS SECTOR

Option Three provides a path to produce and sell goods and services that
can improve the quality of life not only for the aged but also for a wider
consumer market. As the technology cost involved is relatively low, this
allows smaller businesses to participate in the potentially competitive market. These products not only offer consumers *convenience*, but also provide opportunities for the business sector to invest in projects without a vast amount of capital. Moreover, the actual displaying, explaining and servicing of the products are not likely to be complicated. As the products are designed to assist not only the aged but are meant to appeal to a wider group, there is a strong element of *flexibility* in the ways that businesses can promote them. It is *psychologically* easier, too, to promote products that are produced to be *user-friendly* and as they are relatively ‘simple’ products, the *safety* factor is also easier to control.

The business sector can stimulate the economy by promoting the development of goods and services using barrier-free technology as well as universal design. Whilst Japan is the leader in the ageing population stakes, other advanced countries are following closely and the potential market for these goods is likely to continue expanding. Moreover, there are positive images for companies that direct their resources in producing helpful goods for the well-being of their society.

### 9.4.6. RESEARCHERS INVOLVED IN TECHNOLOGY DEVELOPMENT

For those involved in researching and devising barrier-free technology, the scope and creativity may not be as extensive or challenging as in areas of high-level technology. However, there are enormous possibilities of achieving means to improve the *quality of life* for a large population. For those with research interests but without extensive time or funding, the
relatively low cost and relatively short time frame required to research in this area might prove very attractive. Moreover, it may be convenient for those with research interests to have the flexibility to work in their spare time and yet make valuable contributions. The psychological effect of Option Three for these researchers can be very positive in seeing people’s lives practically improved as results of their research. On the other hand, for those engaged in full-time research in cutting-edge technology, Option Three may lack the challenge and opportunities for creativity. As for safety issues, they are important but easier to control for smaller-scaled technology. Being user-friendly is the essence of barrier-free technology and a critical point of consideration for those who are engaged in researching in technology for aged care. However, for those involved in longer term research on more sophisticated technology, being user-friendly may not be critical.

Although academic researchers may wish to be seen as socially relevant, their creative scientific research is more often designed to produce new or cutting-edge technologies applicable for societal needs in the longer term. As technology in Option Three is user-driven and user-oriented, there would be fewer full-time academic research opportunities and not as much status to be achieved. On the other hand, Option Three may create more opportunities for independent inventors and social innovators. Therefore this option is likely to attract the more practically minded technicians to create, improvise or modify goods and services in pursuit of a barrier-free society.

In summary, the following table outlines the main consequences to different
groups with Option Three of concentrating on developing smaller-scale technology such as barrier-free technology for aged care:

### Table 9.3 Consequences of Option Three

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MAIN CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aged/care receivers</td>
<td>Possibly enhance independence by improving the ability to carry out activities of daily living; enhance social participation and quality of life</td>
</tr>
<tr>
<td>Professional care-givers</td>
<td>Possibly easing physical and mental burden</td>
</tr>
<tr>
<td>Family/volunteer Care-givers</td>
<td>Possibly easing physical and mental burden</td>
</tr>
<tr>
<td>Government/public sector</td>
<td>No major changes but may lighten aged care demands; possible increase in business and job opportunities that benefit government</td>
</tr>
<tr>
<td>Business sector</td>
<td>Wide range of opportunities for relatively small capital outlay</td>
</tr>
<tr>
<td>Researchers of technology</td>
<td>Opportunities for independent inventors and innovators but restricted benefit for professional academic researcher</td>
</tr>
</tbody>
</table>

#### 9.5 Conclusion

This chapter examined the potential consequences to different groups in the Japanese society for each of the three technology options for aged care. Option One of relying on standard technologies for aged care in Japan does not imply that aged care technology will be stagnant. Technologies that develop in other countries will gradually be implemented in Japan, as they become standard. This option is unlikely to change the status of the aged who receive care but as the demand for care rises, there may be increasing burdens on family care providers. Some may be obliged to terminate paid employment in order to provide aged care in their families. For professional care providers, there may be more opportunities for jobs and career
Prospects. The government will then be required to address the issues of a depleting labour force and increasing aged care demands.

In Option One, the business sector may increase commercial opportunities in such areas as recruiting and training professional care-givers, or improving on existing technologies for aged care. Possible positive outcomes include increased economies of scale in existing technologies, more investment in improving aged care facilities with current standard technologies, and more labour saving devices in other sectors of the economy to compensate for the transfer of labour to aged care-giving. Researchers in technology for aged care may lose their jobs unless they are able to re-direct their research to other areas or are able to focus on refining existing technology.

Option Two of focusing on Japanese initiatives to develop high-level, sophisticated technology such as robotics provides opportunities for researchers to forge ahead in cutting-edge technology and may enhance their careers and elevate Japan’s international research status. This option also provides opportunities for the business sector to develop big, profitable businesses and a new market that drives investment and hence, the business sector will have a vested interest in this option. The aged themselves will experience complex consequences. On the one hand, robots may enhance independence but, on the other hand, this may lead to isolation. The cost of the apparatus will be relatively high and operating it may be complex, factors very relevant to the aged and their care-givers. Although robots may be helpful and ease the physical burden for the care-givers, their jobs may
eventually be taken over by robots so that they become redundant. If they are to control the robots, new skills may be required and if they become machine minders, their status may diminish. Moreover, if robots become the best technology of choice for aged care, those who cannot afford the most sophisticated robots for their families may feel guilty. The government may need to consider providing subsidies in such cases. It will also need to address the issues of regulations and liability for robots used in aged care.

Option Three of endorsing the development of smaller, less costly technology such as the barrier-free technology may make daily life chores easier for both the aged and their care-givers. There is little impact of this option on the government or the business sector except that it provides opportunities to expand business prospects with relatively small capital and government can provide practical assistance without a huge outlay. Researchers may find this option restricting unless one is an independent inventor or innovator. As this research is a user-driven type, both the aged and the care-givers have the chance to have individual needs met.

By systematically examining the likely consequences of three very distinct technology options for addressing aged care in Japan, the diverse nature of impacts on the various groups within the society is illustrated. This diversity demonstrates the importance of a process whereby technology options are systematically considered in order to assess, evaluate and choose the optimum technology or combination of technologies for the specific problem being considered.
### Table 9.4 Consequences of different technology options in aged care

<table>
<thead>
<tr>
<th>OPTION GROUP</th>
<th>Option (1) only standard technology</th>
<th>Option (2) robotics</th>
<th>Option (3) barrier free technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aged/care receivers</td>
<td>No change with the exception of possible improvements in human skills and empathy</td>
<td>Possibly enhance independence or increase isolation: Complex adjustment to using robotics</td>
<td>Possibly enhance independence by improving daily life</td>
</tr>
<tr>
<td>Professional care-givers</td>
<td>More jobs and possibly greater career prospects</td>
<td>Possibly enhance task but may result in loss of job: May lose status</td>
<td>Possibly easing physical and mental burden</td>
</tr>
<tr>
<td>Family/volunteer care-givers</td>
<td>No change but more may need to leave paid employment to care for aged family</td>
<td>As above with extra possibility of guilt if unable to afford robots</td>
<td>As above</td>
</tr>
<tr>
<td>Government/Public sector</td>
<td>Need to address increasing demand for care-givers</td>
<td>Need to address regulation, liability, subsidies issues</td>
<td>No major change but job opportunities benefit government</td>
</tr>
<tr>
<td>Business sector</td>
<td>Possible business: to train more care-givers: to invest in best existing facilities: develop economies of scale for existing technologies: create labour saving in other sectors</td>
<td>Possible business to expand: new market opportunities both domestically and internationally</td>
<td>Wide range of opportunities for relatively small capital</td>
</tr>
<tr>
<td>Researchers of technology</td>
<td>No new technology research: possible loss of position: require new research area or refine existing technology</td>
<td>Exciting cutting edge technology research opportunities to raise research profile and status</td>
<td>Good opportunities for independent investors and innovators but restrict professional academic researchers</td>
</tr>
</tbody>
</table>