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EXPLORING JAPAN'S SOCIETY 5.0

Identifying key factors shaping the development of Society 5.0

Master´s Thesis
in Futures Studies

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1 INTRODUCTION

1.1 Introduction to the topic

In an era of a rapidly changing world with high uncertainty, countries are urged to take effective, efficient and transformative measures to keep up with the speed of the change. The technological, economic, and social transformation will generate new values and continue to change the process of creating novel ideas for innovation (Fukuda 2020, 1). To respond to such global trends, the government of Japan has unveiled a vision which is called "Society 5.0" or "super-smart society" as a core pillar in the 5th Science and Technology Basic Plan adopted in 2016 (UNESCO 2019; Fukuyama 2018, 47). At the same time, Society 5.0 has received significant support from industry in Japan. (UNESCO 2019.) For example, the Japan Business Federation (Keidanren), which is a comprehensive economic organisation comprised of the country's largest corporations, modelled the Society 5.0 by releasing its policy proposal for it (UNESCO 2019; Potocan et al. 2020, 795).

We are now in the midst of beginning to incorporate emerging digital technologies including artificial intelligence, the internet of things (IoT), robotics, big data into our everyday life and every industry (Fukuyama 2018, 47). These technologies are the innovations of Industry 4.0, which is characterised by machine-to-machine communication with minimal human intervention (Ghobakhloo 2020, 2). The concept of Society 5.0 is that society can be positively transformed by utilising Industry 4.0's various digital technologies. Therefore, positive societal transformation is the centre of this vision. (Holroyd 2020, 1−3.) On the other hand, the main actor in Society 5.0 is not the emerging technologies but people. Society 5.0 is not the next paradigm shift that automatically comes nor the extension of today's information society, but people are required to challenge the conventional way of thinking and co-create the society with novel ideas and practices (Deguchi et al. 2020, 87.)

While technological transformation has vastly promoted our lifestyle by making our life more convenient and efficient, it has also created complex social issues such as data privacy issues and growing inequality in the labour market. In addition, the world is currently facing multiple underlying social issues such as climate change, natural disasters, rapid population ageing, and food security that need to be tackled. Therefore,

Society 5.0 also aims at resolving these social issues through the utilisation of cutting-edge technologies (Konno & Schillaci 2021, 483-484).

The purpose of this research is to gain a comprehensive understanding of Society 5.0 and gain insights on the potential key factors shaping the development of Society 5.0. Since Society 5.0 is still at the concept stage (Deguchi et al. 2020, 2), concrete and feasible examples, which guide toward the realisation of a desirable future society, seem to be essential. Therefore, this research focuses on exploring how Society 5.0 can be realised and what factors will shape the development of it. In addition, differences between Industry 4.0 and Society 5.0, main players to facilitate Society 5.0, and applicability of Society 5.0 not only in Japan but also in other countries are explored. This thesis may initiate further discussion to steer Society 5.0 in the right direction which leads to positive societal transformation.

1.2 Objectives and research questions

The two research questions were formed in order to first gain in-depth understanding of Society 5.0 and then identify what factors may drive the realisation of Society 5.0.

1. What is Society 5.0 and how does it differ from Industry 4.0?
2. What are the key factors shaping the human-centred society illustrated in Society 5.0?

The materials used to answer the research questions are multiple data gained through literature review and the result of data analysis based on interviews. The details of the methodology will be further discussed in Chapter 3. The first research question's first part, "What is Society 5.0" will be answered fully through the literature review. The second part "How does it differ from Industry 4.0?" will be explored based on the literature review as well as insights shared during the interview session. By responding to the first question, I will be able to gain a better understanding of how societal challenges and digital transformations are shaping the advancement toward Society 5.0 and how it may impact Japanese society as a whole as well as other countries who wish to follow the model of Society 5.0 in the future.

For the second research question, analysing answers provided through the interview session will play a decisive role in answering the question. The aim of this research is not to present alternative multiple images of future or scenarios which is often discussed as the core point of future studies. Instead, this research approaches to future studies by exploring possible key driving forces that has led to the creation of the concept of Society 5.0 and possible key factors that will shape the vision of Society 5.0.

This thesis is organised in the following: Chapter 1.3 discusses how this research is related to future studies. Then Chapter 2 provides the comprehensive background of Society 5.0 and potential key elements to realise Society 5.0. Chapter 3 displays methods and materials which are used in order to answer the research questions. Chapter 4 provides the findings of each sub research question. In Chapter 5, the second research question of this thesis will be answered through an overview of the findings and analysis. Lastly, a comprehensive conclusion including the limitation of the research is discussed in Chapter 6.

1.3 Future studies and its relation to Society 5.0

Society 5.0 takes a holistic approach where government, business, and academia are involved as a whole. This comprehensive nature of the vision represents a substantial shift from conventional national economic planning, which have been inherently incremental and path dependent for a long time. Japan has sought short-term commercial profits and paid much less attention to the societal issues, which can have long-term impacts on society as a whole and the world. (Holroyd 2020, 3.) This is the nature of capitalism and also applies to many other countries. Thus, a major transformation is required to have a desirable and resilient future.

As Society 5.0 was formulated by combining the outcome of multiple foresight methodologies (Shichijo & Akaike 2018, 149), this research is explicitly related to future studies. Methods of futures research help indicate what is possible and also sort out policy choices (Glenn 1994, 6). The objectives of future studies are to explore possible, probable, preferred, and plausible futures (Bell 1997, 73), as shown in Figure 1.

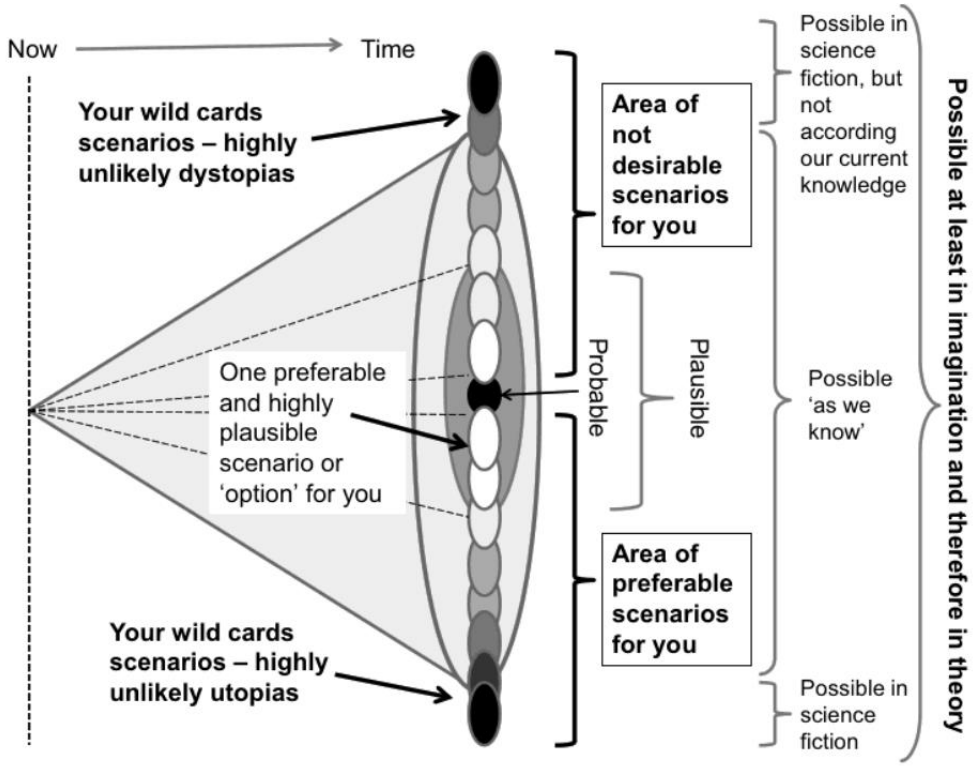


Figure 1 (Kuosa 2016, 41) Futures cone and wild cards.

In addition, the aim of future studies is not about predicting a single future, but about evaluating the probabilities of alternative futures (Bibri 2018, 8). While the aim of this research is not to present alternative multiple images of future or scenarios, possible driving forces that have led to the creation of the concept of Society 5.0 and possible approaches that are needed to shape the vision of Society 5.0 will be explored. Hence, a problem-oriented approach to future studies was taken in this research by examining possible driving forces, approaches and strategies for Society 5.0 in a setting of future-oriented thinking.

Society 5.0 vision and foresight have multiple common elements. First of all, given that Society 5.0 itself is a vision that should be attained at a societal level, visioning is one of the approaches which is highly relevant to Society 5.0. Visioning stands for the creation of the desired future, such as plans, goals, purposes, and outcomes, through action (e Cunha et al. 2006, 948; Bibri 2018, 10). By making images or recognising views of the desired future, people and organisations can not only be encouraged to seek new opportunities and untapped possibilities but also be challenged to think out of the box (Bibri 2018, 10). Additionally, taking the visioning approach maintains a shared understanding, goal, and purpose among people. By applying futures methods to

generate visions, a shared future vision can be created, and people can head toward the common goal (Glenn 1994, 4). In such a situation, relevant knowledge can be dispersed throughout those who participate in progressing towards an envisioned future. In fact, Society 5.0 calls for the involvement of numerous organisations, ranging from large corporations, small-medium sized companies, multiple government agencies, research entities, universities, regional governments, business associations, to others. (Holroyd 2020, 3.) This leads to the conclusion that it is likely that Society 5.0 vision is formulated based on the visioning approach.

Second, a backcasting method may have a profound impact on realising Society 5.0 vision. Backcasting is concerned with how envisioned futures can be attained rather than mapping out what is likely to occur. In other words, backcasting is not about anticipating or predicting the future. (Bibri 2018, 10.) Backcasting is one of the types of normative scenario studies which deals with the question of "How can a specific target be reached?". Thus, certain future states or purposes and how these could be attained are the focus of interest. (Börjeson et al. 2006, 728-729). Normally, scenarios can be categorized into two distinctive groups, i.e., normative or exploratory scenarios. In normative scenarios, the visions and norms are set by the author in the beginning. Therefore, preferred future images, objectives, or visions are constructed. The author can then attempt to describe how those preferred futures could be achieved from the present state. On the other hand, explorative scenarios explore rather possible and probable futures than preferred futures. This method identifies a logical path from the present state to possible futures and requires empirical evidence. In the beginning, the author does not know how the scenarios will unfold towards the end. (Kuosa 2014, 28-29.)

Among normative scenarios, there are also two types of scenarios, which are preserving scenarios and transforming scenarios. If a target seems to be possible to be attained within a prevailing structure of the system, the preserving scenarios would be suitable. In contrast, if a target cannot be reached with an ongoing system, the transforming scenario approach can be appropriate. Backcasting is the approach that applies to the transforming scenario. The target is typically a high-level and is set in a rather long-time frame. (Börjeson et al. 2006, 728-729). The outcome of a backcasting approach is to discuss multiple possible and desirable futures, together with a presentation of workable strategies to reach the futures (Börjeson et al. 2006, 729; Milestad et al. 2014, 69). The point of backcasting is to spur searches for new pathways along which

development can unfold, that is, finding options that fulfil visions set in a long-term span. (Börjeson et al. 2006, 729).

The backcasting approach is considered to be well-suited if the study has target-fulfilling and problem-solving character (Bibri et al. 2019, 6). In fact, Fukuda (2020) states that Japan has gradually strengthened the approach from discipline-based to problem-solving under Society 5.0 to overcome the underlying long-term challenges such as the ageing population and the skyrocketing national debt and to aim at opening up the innovation process. Therefore, all stakeholders who are involved in the creation of Society 5.0 vision are encouraged to adopt this strategic problem-solving framework to reach the vision in the future. In this sense, this research is well-suited for this approach since the aim of this research is to find out approaches to attain the long-term vision of Society 5.0. The first step is to identify the desired future state (Bibri et al. 2019, 6). In this case, Society 5.0 is the desired futures state in this research. In the second step, the current problems and issues are analysed. In the third step, approaches are analysed and presented to reach the vision. This thesis set out to depict how Society 5.0 can be reached and sought out to explore approaches for it by the use of backcasting study. Hence, workable approaches to attain the human-centred society illustrated in the vision of Society 5.0 applies to the backcasting approach.

Moreover, those organisations who consider Society 5.0 as one of the significant visions for the Japanese society's future may also understand the significance of applying future-oriented thinking and foresight methodologies to facilitate Society 5.0. For example, a Japanese multinational corporation, Hitach, Ltd. is partnering with several universities in Japan to realise Society 5.0 and resolve multiple challenges based on that vision (Harayama & Fukuyama 2017). While a majority of small and medium-sized organisations are probably familiar with neither Society 5.0 and foresight or future studies, they might be interested in engaging in foresight activities and spark interests towards realising Society 5.0 collectively, considering the increasing popularity of foresight in Japan (Washida et al. 2018, 93).

2 THEORETICAL FRAMEWORK

2.1 Industrial Revolutions

Before defining Society 5.0, this subsection explores industrial revolutions to understand how the society and the industry evolve over time. Opinion on how to categorise industrial revolutions and societies vary depending on the sources. In addition, the difference between the terms "Society" and "Industry" (or "Industrial Revolution") is often confusing. For example, the Cabinet Office, Government of Japan (n.d.) uses the term "Society" rather than the term "Industry", defining the types of human society from Society 1.0 to Society 4.0. However, not only the society but also the industrial revolution plays a key role in describing the development towards Society 5.0. Therefore, I decided to use Keidanren (n.d.)'s description as the main reference to better understand the path towards Society 5.0, as it uses both terms, "Society" and "Industrial Revolution" by depicting them with clear visualisation shown in Figure 2.

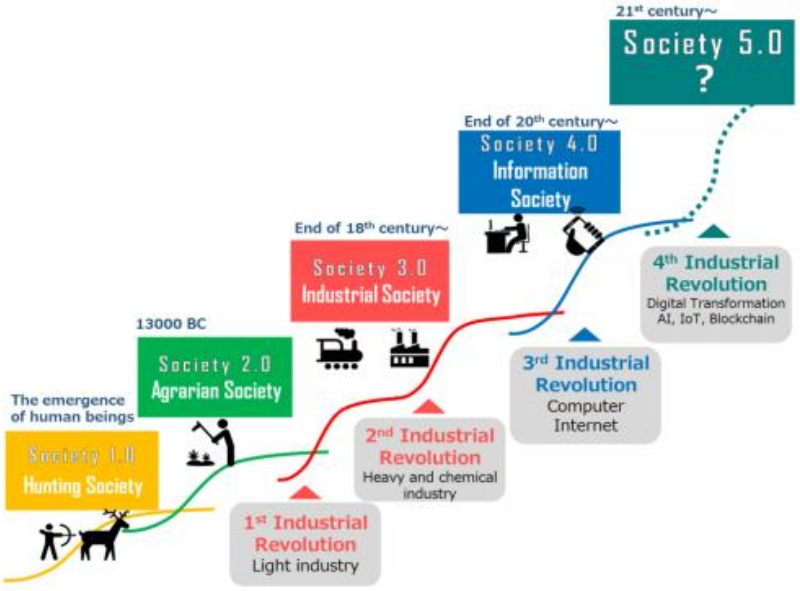


Figure 2. Development of Human Society. From Keidanren. (n.d.). Society 5.0: Co-creating the Future.

Up to the present day, humankind has embraced four types of society as follows:

- Society 1.0: Hunting Society – The emergence of human beings
- Society 2.0: Agrarian Society – Development of irrigation techniques
- Society 3.0: Industrial Society – Invention of steam locomotives and start of mass production
- Society 4.0: Information Society – Invention of computers and start of information distribution

(Kuczynska 2019; Keidanren n.d., 5)

In order to complement the visualisation of the Figure 3 and better understand each societal revolution, Figure 3 is added.

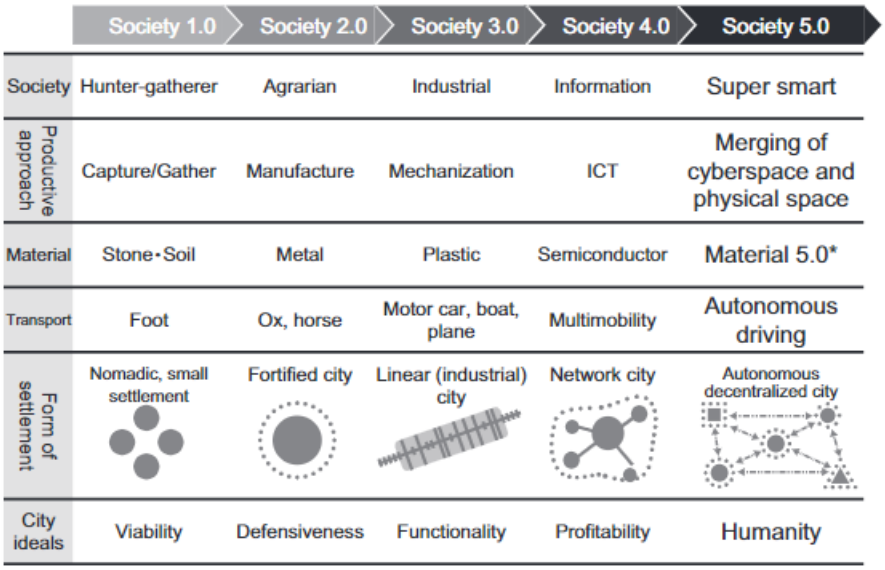


Figure 3. Deguchi et al. (2020) Contextualizing Society 5.0. Categories created by the authors.

Industrial Revolution, on the other hand, does not correspond with the chronological path of each societal revolution. For example, it may happen in the early, middle, or the last stage of a certain society and each industrial revolution pushes forward to the next societal revolution as follow:

- Industry 1.0: Light industry – The last stage of Society 2.0
- Industry 2.0: Heavy and chemical industry – The middle stage of Society 3.0
- Industry 3.0: Computer and Internet – The first stage of Society 4.0
- Industry 4.0: Digital transformation with the emergence of e.g., AI, IoT, and Block chain – The last stage of Society 4.0 and the first stage of Society 5.0

(Keidanren n.d., 5)

Each societal revolution is built on the previous societal revolution. Shifting from Society 1.0 to Society 2.0, humans acquired and strengthened the capability to produce food through agriculture (Keidanren n.d., 6). In Society 3.0, they enhanced production capabilities, leading to mass production harnessing electric power. In the current Society 4.0, electronics and information technology drastically increased automation capabilities as well as the freedom to access all kinds of information via internet-based services. (Keidanren n.d., 6; Schwab 2016). Following the paths of the societal revolutions, the next society is termed as "Society 5.0" in the 5th Science and Technology Basic Plan, which was adopted in 2016 by the Japanese government (Keidanren n.d., 6; Fukuyama 2018, 47). All four industrial revolutions are placed within the societal revolutions as mentioned above and depicted in Figure 2. Each industrial revolution shapes and triggers the transition towards the next societal revolution. Furthermore, Society 5.0 can also be realised through the implementation of Industry 5.0 (Potocan 2021, 797), while the terms, Society 5.0 and Industry 5.0, are sometimes used interchangeably depending on how the authors define them.

2.2 Industry 4.0

This subsection sheds light on Industry 4.0 to explore what it is and how it could support the next phase of the industrial revolution on the horizon. As described in the previous subsection, Industry 4.0 plays a key role in Society 5.0. For this reason, it is important to examine the concept, major technologies, their maturity, and their impacts on society.

Industry 4.0 can be also stated as the 4th industrial revolution and its concept first emerged in Germany in 2011 (Ferreira & Serpa 2018, 27). It is commonly referred to the digital transformation of the business environment characterised by a fusion of diverse technologies that is integrating the physical, digital, and biological spheres. (Ghobakhloo 2020, 2; Schwab 2016). More specifically, the interconnected computers, smart machines, and intelligent materials communicate with one another and eventually

lead to decision-making with minimal human intervention in the Industry 4.0 environment (Gilchrist 2016). The true force of Industry 4.0 is the digital connectedness and advancement and sharing of information. From the emergence of smart manufacturing to the digitisation of whole value delivery chains, the digital transformation of the entire markets of industries and consumers are involved in Industry 4.0. (Ghobakhloo 2020, 2−3.)

The digital transformation in the Industry 4.0 is based on the implementation and integration of multiple different simple to advanced technologies. They include such as artificial intelligence (AI), cloud computing, robotics, augmented and virtual reality, industrial sensors, and industrial controllers. (Ghobakhloo 2020, 3.) Many of the technologies which act as an enabler of Industry 4.0 has been around since about forty years ago (Gilchrist, 2016). However, they just started entering maturity in recent years in terms of the capability of integrity and interoperation which is of necessity for digitization.

The sophisticated technologies such as the Industrial Internet of Things (IIoT) can be achieved by integrating various above mentioned both simple and advanced technologies to build a dynamic cyber-physical control space. The combination of these technologies ensures industrial operations in an efficient and reliable fashion. (Ghobakhloo 2020, 3.) Therefore, each technology cannot operate independently under Industry 4.0 (Gilchrist, 2016). This means that integration of technologies and interoperability play a decisive role in ensuring that different elements of a value chain environment such as smart machinery, digital fabrication and products, control and monitoring systems, connected customers and its organisation, and decision-making systems interact, communicate, and share data with each other in a seamless and connected manner (Ghobakhloo 2020, 3.)

Opportunities brought by Industry 4.0 is that the quality of life for people around the world could be improved with greater efficiency and convenience driven by technological innovation (Schwab 2016). In a global logistics and supply chain environment, the entire systems such as manufacturing operations, location tracking, and customer services can be highly automatised and optimised by using the combination of diverse technologies. It is also capable of facilitating an agile, effective, flexible, and decentralised production network responding to the ever-increasing various customer requirements (Schwab 2016; Ghobakhloo 2020, 3). Thus, Industry 4.0 envisions the creation of

new value as well as the significant reduction of manufacturing costs (Deguchi et al. 2020, 19).

On the other hand, Industry 4.0 also holds multiple challenges which are expected to affect society significantly. One of the tremendous challenges is the potential critical disruption in labour markets (Schwab 2016; Ghobakhloo 2020, 2). The lack of digital culture and training could be an immense barrier for organisations and companies to find suitable workers who obtain the analytical and advanced digital skills (Nagy et al. 2018, 18). Furthermore, the advent of a high degree of automation enabler technologies will displace the majority of less educated and lower-skilled workers, exacerbating the inequality and the wealth gap (Schwab 2016; Ghobakhloo 2020, 2). The likeliest scenario is that a labour market will be increasingly segregated into two segments, "low-skill/low-income" and "high-skill/high-income", which middle-skilled jobs are hollowed out (Schwab 2016; Fukuda 2020). This will, in turn, lead to a worsening social tension (Schwab 2016). In fact, this has been already happening around the world. The Covid-19 pandemic has revealed and exacerbated the pre-existing labour market inequalities. This is largely because the ability to work from home is closely correlated with high-skilled sectors such as information and technology. While strong job growth is expected in high-skilled industries on current trajectories, continued job losses and slow recovery are expected particularly in the lower-skilled industries. (Ferreira 2021.) Thus, digitisation has already been creating disparities between high-skill and low-skill workers.

Not only the inequalities between high-skilled and low-skilled workers, racial and gender disparities are deeply entrenched in the labour market around the world. For example, women are at higher risk of leaving their workplace due to their caregiving roles for children and older family members. (Ferreira 2021.) Additionally, the concentration of wealth is growing exponentially as seen in an example of the rapidly increasing dominance of the big tech giants such as Google, Amazon, Tesla, Apple, Facebook, and Microsoft. It is indeed interesting to see how Society 5.0 embraces these opportunities and challenges which have arisen from Industry 4.0 and how all stakeholders attempt to realise Society 5.0 in order to tackle these chronic societal challenges.

2.3 Background of Society 5.0

2.3.1 Defining Society 5.0

The vision of Society 5.0 first appeared in 2016 in the Fifth Science and Technology Basic Plan. The Council for Science, Technology and Innovation (CSTI) issues the plan every five years as a Japanese national strategy. The process of the creation of the vision Society 5.0 also involved the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Economy, Trade and Industry. As a result, the government-wide national vision of Society 5.0 was established for the future of Japan. (UNESCO 2019.) As CSTI publish the 6th Science and Technology Basic Plan in 2022, Society 5.0 will be included as the cornerstone of the plan (Holroyd 2020, 11).

While Industry 4.0 focuses on a high degree of automation enabled by smart technologies with minimized human intervention, Society 5.0 will put our focus back on humans supported by the evolution of technology (UNESCO 2019). This means that Industry 4.0 aims at a high degree of automation especially in the manufacturing sector, whereas in Society 5.0, cutting-edge technologies are applied not only in the manufacturing sector but also implemented across society as a whole to solve emerging societal issues by putting the people as the primary focus. Therefore, the objective of Society 5.0 is to create super-smart society by drastically transforming the society beyond the industry. (Lundin 2018, 4 – 7; Deguchi et al. 2020, 19.)

Critics say that the focus of Industry 4.0 is concentrated too much on the economic and technological perspectives. In order to unlock the true potential of innovation overcome diverse sustainability problems in society, not only the technological impact but also the social impact must be taken into consideration. (Ferreira & Serpa 2018, 28.) Therefore, as one of the definitions of Society 5.0, it stands for a human-centric society where economic advancement is balanced by resolving various social issues with a cyber-physical system. (UNESCO 2019; Cabinet Office, Government of Japan n.d.). In order to understand more about the definition, each term mentioned in the definition is described as follows: various social issues refer to, for instance, concentration of wealth, climate change, food waste, depopulation of rural areas, a largely shrinking labour force due to the aging society. The cyber-physical system means that cyberspace (virtual space) and physical space (real space) are integrated at a high degree (UNESCO 2019).

In cyberspace, artificial intelligence analyses big data, and the analysed data is sent back to people in physical space. This analysed data can be used in various forms such as for self-driving vehicles and automatic production. Therefore, it is not necessary for humans to analyse the collected information. Instead, emerging technologies such as the internet of things (IoT), artificial intelligence and robotics play a significant role in generating optimal results, exceeding the capability of humans. (Cabinet Office, Government of Japan.)

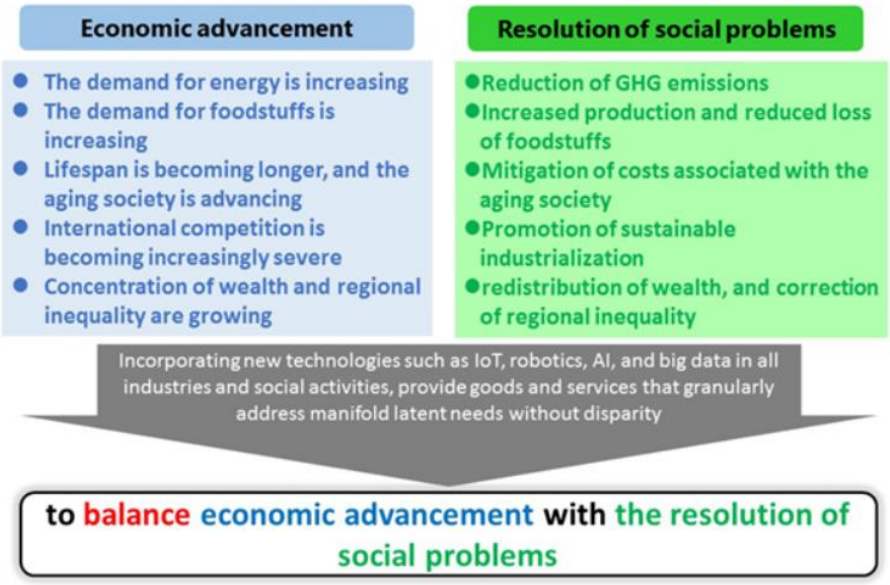


Figure 4. Cabinet Office, Government of Japan. Society 5.0 Balances Economic Development and Solves Social Issues

2.3.2 Population ageing as one of the most critical social issues

As Society 5.0 aims at addressing multiple economic and social challenges (Fukuda 2020, 2), this sub-chapter explores one of the most pressing societal and economic challenges which might have led to the creation of the concept of Society 5.0. One of the most pressing societal and economic challenges which may have immense and long-term effects on the whole society is the demographic change arising from the ageing population and extremely low birth rates (Konno & Schillaci 2021, 491). Japan is used as a case country since the concept of Society 5.0 originates from Japan. Additionally,

the demographic challenges that Japan faces are challenges that will also eventually impact not only other industrialised countries but also developing countries (Fukuyama 2018, 47).

As is the case with many developed countries, Japan used to have a period which experienced high economic growth and high rates of private saving due to a growing working-age population. This is called demographic dividend and thanks to this, Japan reaped considerable benefits during the 1980s (Goh et al. 2020, 17). However, for the past several decades, Japan has been rapidly experiencing demographic changes, with the ageing population and low fertility rates. Among the developed countries, Japan is one of the countries which holds the most rapidly ageing populations. According to a 2016 statistic of the Ministry of Internal Affairs & Communication, Statistics Bureau, cited by Goh et al. (2020), above the age of 65 years old accounts for 26.7 per cent of the population in Japan. By 2050, it is projected that 40 per cent of the total population will be formed by this age group. This is by far the highest proportion globally. (Goh et al. 2020, 1.) This ageing population has, in turn, worsen the fiscal balance, with the proportion of social security cost to nominal GDP being projected to increase from 23 per cent in 2010 to 42,9 per cent in 2060 (Parsons & Gilmour 2018, 2.)

Moreover, according to the United Nations Statistics Division (2017), as referred by Fukuda (2020), from 2010 to 2015, the population of Japan had declined by 0.7 million. By 2050, it is projected to shrink by one-fifth to nearly 100 million (Jones & Seitani 2019, 7). The working-age population between 15-64 years old is also expected to drastically decline in the coming decades. As indicated in Figure 5 below, compared to Germany and the United States as examples, Japan is in an unfavourable position for the labour force. While it is expected that Germany's proportion of the working-age population drops slower than Japan between 2015-2050, the United States is projected to continue to increase by 22.3 million during the same period. (Fukuda 2020, 9.) Looking further into Japan's labour force forecast, if labour market entry and exit by gender and age groups stay constant at 2017 levels, by 2030 the labour force would shrink by 4.5 million and by 2050 it would shrink by 16.1 million, which accounts for 24 per cent, as indicated in Figure 6 (Jones & Seitani 2019, 7).

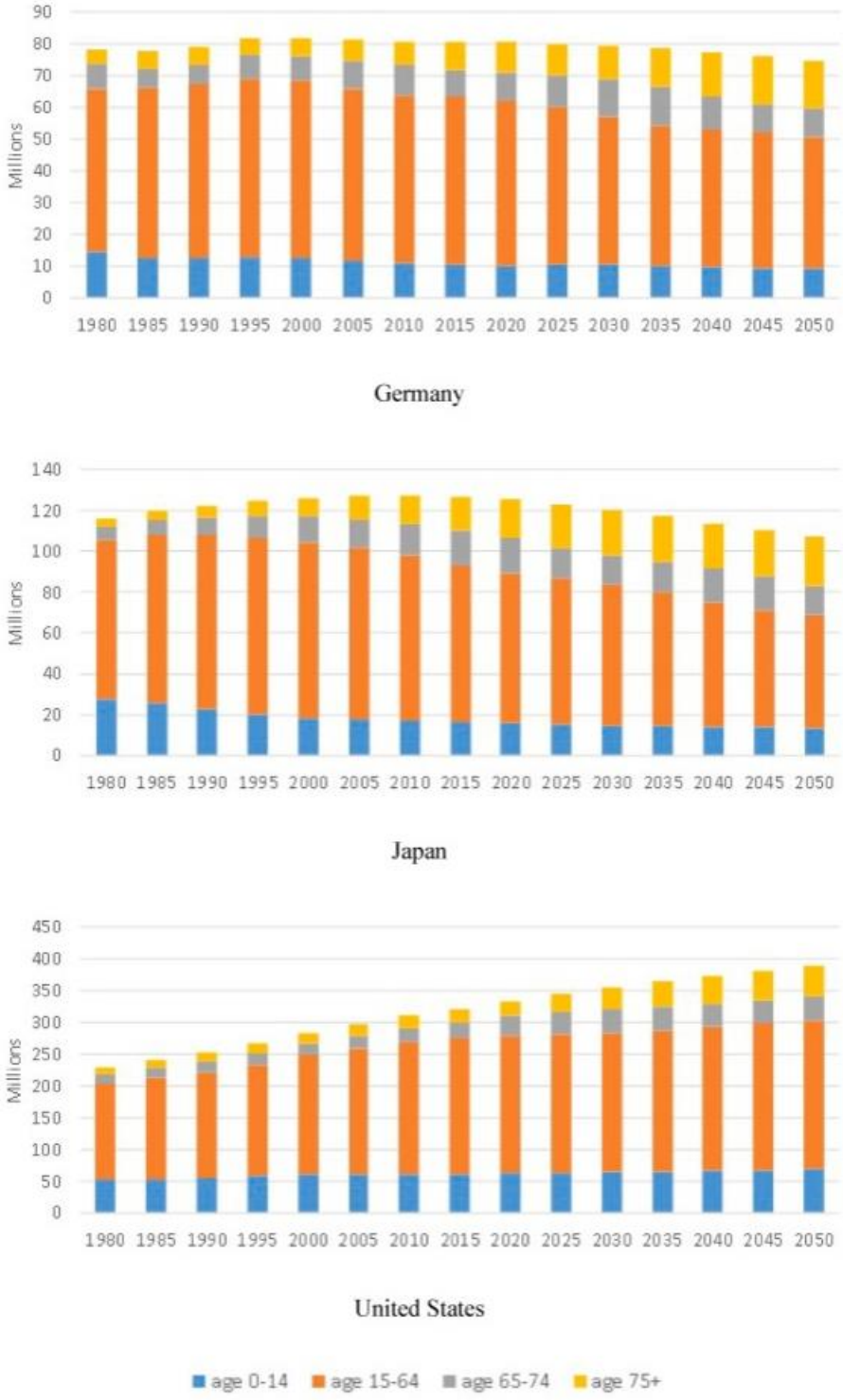
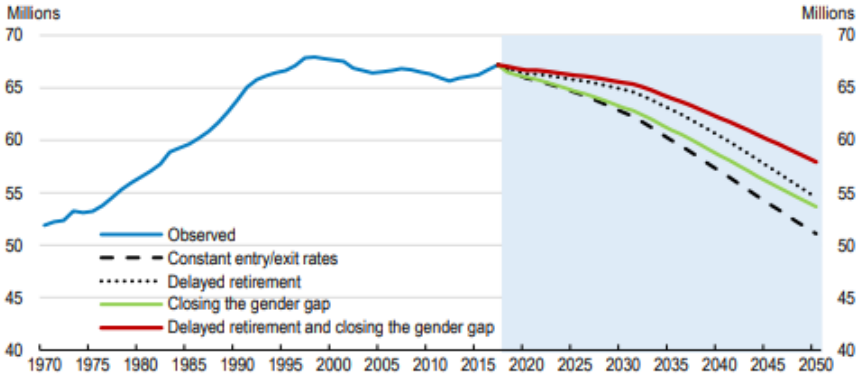


Figure 5. (Fukuda 2020) Population trends in three countries by age (millions), 1980-2050 (five year intervals). Data from united Nations Statistics division (2017).



Note: The baseline assumes constant labour market entry and exit rates by gender and five-year age groups. In the "delayed retirement scenario", exit rates are reduced for both men and women by 10% for each five-year age group between the ages 55 and 74. In the "closing the gender gap" scenario, the participation rates for women converge to those for men in each five-year age group by 2050.
Source: OECD projections based on data from the OECD Population and Labour Force Projections database.

Figure 6 (Jones & Seitani 2019, 6) Japan's labour force faces a significant decline

In order to cope with population ageing and low fertility rates, Japan has been attempting to respond to them with different strategies and policies. For example, efforts to mitigate the burden of childcare, and thus indirectly increase the fertility rate, include a proposal of the adoption of a new parental leave system, such as enabling men to take child care leave right after childbirth, and the increase of childcare capacity throughout Japan (Parsons & Gilmour 2018, 2.; Mizoue 2021).

In order to tackle the ageing population, migration policy is also an essential element to be considered. At the enterprise level, domestic companies, especially the information technology (IT) sector, are aggressively attempting to hire foreign-born workers and students who have a university degree (Parsons & Gilmour 2018, 2; Lim 2019, 87). At the governmental level, the fast-track residency scheme was adopted in 2017 for highly skilled foreign professionals such as researchers, lawyers, doctors, engineers, and innovative entrepreneurs (Parsons & Gilmour 2018, 2; Lim 2019, 86). This allows them to apply for permanent resident visa status after they have lived in Japan only for one year (Lim 2019, 87). Japan's Ministry of Justice accepted 8515 highly skilled foreign workers in 2017 and is aiming to increase the influx of them to 20,000 by 2022 (Lim 2019, 86). Not only for highly-skilled foreign professionals but also skilled workers such as in technical fields started to gain residency eligibility with more flexible conditions. In fact, a senior Liberal Democratic Party, which is a political party considered relatively conservative, expanded the categories of professions and positions

foreigners can apply. (Lim 2019, 87-88.) While foreign talent policies tend to focus on highly-skilled professionals and those who are engaged in occupations related to technical fields, it is also required to pay attention to the fields which have an issue of manpower shortages. Considering the fact that Japan lacks a significant number of caregivers and nurses (Kamibayashi 2015, 88), it is reasonable that the government relaxes the conditions to accept workers who possess the skillsets in such fields which suffer from shortages of human resources.

Meanwhile, Parsons & Gilmour (2018, 2) argue that policy makers should also explore alternative means to address population ageing in case the measures to increase the fertility rates and immigrants are not effective enough to combat the burden of ageing. As their research indicates, neither fertility nor migration-based policy means will be able to considerably address Japan's ageing population in the coming decades. Therefore, rather than promoting these policies, Japan will be required to focus on a strategy of adaptive approaches by enhancing productivity with its own human capital, increasing the working participation of elderly individuals, and actively investing in technological advancements. (Parsons & Gilmour 2018, 10-11.)

As one of the alternative ways to activate and increase its labour force using the existing human capital, rather than depending on the massive influx of immigrants or increasing the birth rates, the extension of the retirement age could be considered. According to a survey conducted by a Japanese government in 2012, about 75 per cent of people who are over 60 wish to continue working even though they have reached the mandatory retirement age. As the delayed retirement scenario shows in the Figure 6, the labour force in 2050 would be 7 per cent more than the scenario of constant labour market entry and exit. (Jones & Seitani 2019, 7). Still, I argue that this scenario should be complemented with the help of technologies as people get older, they naturally have less power and energy to work than younger ones. Therefore, automation and physical strength enhancement technologies such as robot exoskeletons have a great potential to enable the elderly population aged over 65 to be still involved in the labour market. Not only the elderly, but also women, caregivers, farmers, and other physical strength-intensive workers can reap the benefits of robot exoskeletons by alleviating the pressure of heavy lifting (Lim 2019, 93). The robot exoskeletons also help elderly farmers keep working in agricultural areas, including one of the most important productions of rice. This may make up for the phenomenon of underpopulation in rural areas and promote food self-sufficiency in Japan (Lim 2019, 94). Hence, it is essential for Japan to enhance

the capability of being at the forefront of technological development and advancing the mass production of such technologies, in order to make this delayed retirement scenario happen in a most effective way and cope with Japan's manpower issues.

Moreover, one of the most critical issues to be addressed in Japan's labour force is women's inclusion in employment. While women's employment in Japan is high, they tend to work as part-time, temporary or fixed contracts, which can be defined as non-regular jobs, after reaching certain ages. In contrast, this tendency is not seen in men's employment. In fact, many women quit their jobs to have the role of caregivers for their children and elderly relatives (Jones & Seitani 2019, 11). Gender inequality in Japan's labour market is one of the most pressing issues. When female workers who have a permanent position at their workplace exit the labour force for the role of a caregiver, they typically cannot return to the labour market with a permanent position. Instead, they tend to have a lower wage position with non-regular jobs. This, in turn, contributes to a significantly high gender wage gap. (Jones & Seitani 2019, 27.)

Women's inclusion and a significant reduction in the gender gap in the labour market is an essential element of addressing the ageing population. As one of the scenarios, which denotes "closing the gender gap" shows in Figure 6, if the female participation rates were equivalent to the male participation rates by 2050, the labour force would be higher by 5 per cent than the baseline of the constant labour entry and exit rates (Jones & Seitani 2019, 7.)

Therefore, keeping more elderly in the job market and empowering female workers with better working conditions may mitigate the negative effects of aging populations. However, additional boosts will be needed to comprehensively address the Japan's ageing population. Although Parsons & Gilmour (2018) assessed that immigration policies will be unable to respond to the issue remarkably over the coming decades, foreign talent policies that acquire global talents will, at least, contribute to the economic development in Japan. Director Satoshi Kurimoto from the Technical Cooperation Division at the Ministry of Economy, Trade and Industry (METI) states that foreign-born workers can bring diverse aspects to the advancement of management and production as well as become invaluable assets to expand business in Japan to global markets. The Ministry is also hoping to change the image of Japan from a closed-minded to an open-minded country. (Lim 2019, 92.) For these reasons, when it comes to immigration policies, Japan would do best to make up for manpower with foreign workers if the field is severely lacking or is expected to lack the labour notably in the future. In addition to

that, Japan would do best to prioritise the global talent acquisition to advance its economy and add fresh and diverse perspectives to the workplaces.

In terms of global talent acquisition, Japan may increasingly start looking at examples of global talent initiatives around the world. One of the intriguing examples is an e-residency program adopted by, e.g., Estonia. Estonia is the first country that introduced the e-residency which provide a digital identity issued by a government and remote access to a digital business environment without physically settling down in the country. The aim of this program is to attract foreign freelancers, entrepreneurs, and investors by allowing them to, for example, establish a business in Estonia. (Tammupuu & Masso 2019, 621-624.) As the Covid-19 pandemic has reshaped the working style by nearly establishing a norm of a work-from-home model, it can be expected that more and more countries start considering this type of strategies to accelerate digitalization, labour mobility, digital migration, competitiveness, innovativeness, and economic growth. Thus, in order to attract global talents and create an attractive environment for workers, Japan is urged to explore different talent acquisition strategies and focus on cultivating diversity for the labour force.

Table 1 Demographic challenges and key strategies in the response towards Society 5.0

Demographic challenge
Labour shortage accompanied by the ageing population and low fertility rate
Current major strategies being discussed to mitigate the demographic challenges
• Introduction of a new parental leave system to increase the fertility rate • Migration policy to make up for the shortage of human resources
Additional crucial strategies towards Society 5.0
• Development and deployment of automation and physical strength enhancement technologies, which can support the extension of retirement age • Closing the gender gap and empower women to fully capitalise on the domestic labour force • Promotion of foreign talent policies to bring fresh and diverse aspects to the workplaces

2.3.3 Technological means and diversity as key pillars of Society 5.0

To sum up the above-mentioned issues and challenges to respond to the ageing population, alternative means to fertility and immigration policies are required. Likewise, in addition to utilising the existing human capital as a more optimal measure, supportive means play a decisive role in optimising the labour force and leading to sustainable economic growth. One of the most important supportive means, besides global talent strategies, is technology. Furthermore, diversity is the key to generate innovation and diverse value, which is needed for technological innovations and future society.

While there are several reasons why Japan is reluctant to welcome a large number of immigrants, some media reports it is because of the fear of crime rate spikes and inclination of preserving its cultural homogeneity (Lim 2019, 92-93). Thus, instead of immigrants, robots and technologies could be the alternatives to supplement the shrinking labour force. Conservatives address the fact that robots cannot commit crimes and are capable of executing tasks logically and punctually when the migration debates heat up (Lim 2019, 92-93).

It is, however, noteworthy that focusing too much on robots and technologies may end up failing to achieve a paradigm shift from the current society or Industry 4.0. Industry 4.0 heavily focus on the technological revolution including the roles of artificial intelligence, IoT, and self-driving vehicles. Therefore, Society 5.0 will use those technologies as means, but technologies should not be in the very centre in this concept as a shift from Society 4.0 to Society 5.0 means that the paradigm of society changes. As Society 5.0 defines the concept as the "human-centred society", humans are the ones who introduce diversity into the society and create innovations, not the robots and technologies themselves. (Deguchi & Karasawa 2020, 165-170.) Therefore, I assess that relying merely on technological means is not likely to produce favourable outcomes for society in the future. Technological means, coupled with the facilitation of diversity, will be needed for a new societal paradigm shift.

As Rosado (1997, 24) demonstrates that diversity is a necessity because of the societal paradigm shifts, diversity seems to be vital when discussing the paradigm shift. He defines diversity as "biological, cultural, physical and socioeconomic differences (such as race/ethnicity, age, gender, class, disabilities, education, values, sexual orientation, religion, etc.)", rather than just cultural and racial differences. By introducing these to an organization, community, or society, could, in turn, lead to a unity in diversity,

where the joint collaboration exerts a more wholesome influence rather than the sum total of the outcomes composed by each parts' individual works. On the other hand, diversity has the potential to cause conflicts if it is not managed well. Obviously, the more ethnically and culturally diverse an organization, community, or society is, the higher the probability that the conflict or tension happens.

Japan, on the other hand, seems to be still at an infant stage in terms of embracing diversity. Japan holds a strong collectivist culture, where following social norms and maintaining cohesiveness in an organization, group, or society are central in people's minds. People are also likely to prioritise the goals set by these collectives rather than individual's own goals. (Hamamura 2012, 3.) As demonstrated in a school or some organisations where it is mandatory to wear a uniform or suit, "uniformity of appearance" is strongly ingrained in society. Therefore, Japan is often perceived and criticized that it is a highly homogeneous nation. As changing the deeply entrenched culture is not easy and takes decades to accomplish, the vision of embracing diversity set in Society 5.0 seems to be very challenging to accomplish within a decade. Yet, the other side of collectivist culture may play a decisive role in leading to unity in diversity. Collectivism also means that an organization, group, or society as a whole is put into a greater emphasis than individuals.

Additionally, when it comes to diversity in national backgrounds, people who come from collectivistic countries might be more cooperative than those who come from countries with individualistic cultures (Chatman et al. 2015, 4). On the other hand, this could mean that those who come from individualistic cultural orientation may suffer from understanding the culture of valuing the connectedness to members of an organization, group, or society. In any case, it starts from the willingness that Japan accepts diversity. Once the society in Japan accepts and respects diversity as an important part of society, Japan may have a higher probability to succeed in achieving unity in diversity than countries with an individualistic culture. If people embrace and respect diversity and involve diversity in an organization, group, and society and work together to achieve common visions or goals, Society 5.0 could be facilitated as Japan aspires.

2.3.4 Innovation as a leading accelerator for realising Society 5.0

Society 5.0 determined innovations as vital preconditions and driving forces for combating diverse unsustainable societal issues (Potocan et al. 2020, 800). The foundational vision of human-centric society in Society 5.0 holds tremendous potential in generating multiple innovations. In the 1990s, Japan achieved many revolutionary technological innovations in consumer electronics. (Holroyd 2020, 12.) On the other hand, during the decades-long economic stagnation in Japan, its innovation capacity has also weakened. For example, it was not sufficient to tackle the primary issues of an ageing population, the changing nature of work, lack of diversity in various aspects and many others (Holroyd 2020, 2). In order to refocus international attention on Japan's innovation, Society 5.0 plays a potential role in leading to opportunities that create transformational benefits, including increased employment and profits, for countries and the world as a whole, rather than leading to commercial success at a company level. (Holroyd 2020, 12.)

To produce the abovementioned benefits by innovation, it requires a novel approach to investments, planning, and implementations in innovation (Holroyd 2020, 12.) At the moment, organisational activities are mainly focused on technological innovations. This also applies to one of the concepts in Industry 4.0. (Ferreira & Serpa 2018, 28; Potocan et al. 2020, 800.) However, focusing merely on technological innovations may fail to both meet societal needs and facilitate a revolutionary change in society as a whole. Therefore, Society 5.0 broadens the scope of innovations by including non-technological innovations and social innovations by encouraging organisations and all stakeholders to prepare themselves and actively participate in advancing sustainable development and digital transformation (Potocan et al. 2020, 801). The 3rd edition of the Oslo Manual, as cited by Potocan et al. (2020, 801), defines technological innovations as "context-specific organizational actions and policies that take into account stakeholders' expectations and the triple bottom line of economic, social, and environmental performance". On the other hand, the definition of social innovations, among other things, is dedicated more to sustainable social needs that were not taken into account and confronted previously to empower individuals, groups, and organisations (Potocan et al. 2020, 801). Social innovations also refer to far-reaching radical innovations whose impact greatly benefits society as a whole. They are built from and for society, which is the socio-economic fusion that exceeds today's corporate boundaries. (Konno Schillaci

2021, 480.) Thus, Social innovations may be closely relevant to Society 5.0 as it intends to improve societal life and human well-being. In framework of Society 5.0, innovation will continue to be a major contributing factor in achieving robust digital transformation and enhance sustainable economic and social development which Society 5.0 envisions.

3 METHODS AND MATERIALS

3.1 Research methods

This master's thesis is based on a qualitative research method. The qualitative research method is often chosen if the researcher is looking for new ideas and does not know what kind of answers to be obtained from the respondents. On the other hand, quantitative research is more suitable for research that aims to quantify a research material with a great many people's answers. (Fisher 2010, 181) As I sought in-depth discussions and "stories" from the respondents, I did not choose the quantitative method, which seeks more numerical results and cannot be supplemented with additional explanations and in-depths thoughts.

In this study, the sources for the empirical data are twofold: A literature review and a series of interviews. First, I conducted a literature review by employing academic journals, reports, articles, and other online databases as the material. The initial literature review was to guide the study. For the search platform, I used Volter database as the main platform since it allowed for searching reliable academic journals and articles. Volter is the library database system used at the University of Turku, and it indexes a wide range of academic journals and publications. However, some of the materials also originate from company websites, the government of Japan, and universities that have information associated with Society 5.0. Secondly, I conducted semi-structured interviews to allow participants to discuss their own perspectives freely and openly as the discussion develops (Fisher 2010, 72, 171). Interview questions may help interview participants answer questions with more freedom. The selection of the interview participants is based on purposive sampling. I selected the participant who met the criteria and could provide the most relevant insights to my research question (Silverman 2013, 141).

For the recruitment strategy of the interview, I researched the potential interview participants online. According to a literature review conducted in English and Japanese, it seemed that only some large organisations in Japan and researchers in the academic industry have been eyeing Society 5.0. Therefore, I focused on the potential interviewees who work in large organisations and who are actively involved in the research and the facilitation of Society 5.0. Meanwhile, as digital transformation is one of the key pillars to achieve Society 5.0, the selection criteria of participants also included those

who are specialised in technology and digitalisation field and social change, or who have experience in being involved in the research or project of Society 5.0.

For the recruitment process, I contacted potential interviewees through different platforms. I mainly used the LinkedIn platform by sending a message directly to them. I also utilized the LinkedIn Premium option to get a better response from them since some of the members on LinkedIn cannot be contacted without using the premium service. In addition, with the use of the premium service, I was able to send a direct message to a maximum of 20 people with long texts, which is not possible with the unpaid service. Therefore, it was much more efficient to send messages to each of them by describing the purpose of the thesis interview and my research theme. Moreover, a Japanese website called "J-GLOBAL", which is a science and technology information website for articles, patents, researchers' information, etc, was very useful for finding and contacting acknowledged researchers who are or have been involved in the research or a project of Society 5.0. I also contacted those who have published articles related to Society 5.0. As a result, all of the participants have or had some touchpoints or experience with Society 5.0 and have great knowledge and expertise in the field closely associated with Society 5.0. While the concept of Society 5.0 itself was created by the Japanese government, I decided to include interview participants from different countries to have diverse viewpoints about Society 5.0.

I conducted interviews via online video platforms, Zoom and Skype in July 2021. Depending on the participant's preference, the platform for the interviews was chosen. The online interviews were held in English and Japanese depending on their nationality and recorded upon their agreement. However, a few participants asked for contributing to the interview through email by answering my interview questions as they were not able to have an online interview.

3.2 Research integrity

The research was executed by taking into account the ethical considerations. To allow open discussion and consider their privacy, I mentioned to all of the participants that their name is anonymised while some of the participants provided me with the consent to be cited with their full names. Instead, I asked permission to cite their job title and the type of industry their organisation operates in or their research areas. All participants who contributed to the research had the possibility to choose whether their organ-

isation's name and their nationality must be anonymised or not. This was confirmed both in the email and verbally before having interviews. At the beginning of the interview and before the recording started, participants were made aware that they were allowed to skip questions if they are not familiar with the content of questions at all or if they feel uncomfortable discussing them. In addition, I asked participants for the permission to record the interview before asking interview questions and informed them about the fact that the recordings would be utilised only for this research and transcribed using advanced transcription software.

3.3 Participants of the study

At the beginning of the interview, I asked them to explain what kind of touchpoints or experience they have with Society 5.0. This confirmed that all of the participants had in-depth insights into the concept of Society 5.0 and the knowledge to provide me with new ideas and different perspectives. The Table below shows the list of the participants with their job title, research area or industry, and nationality. As a result of the process to look for the interview participants, the majority of them were Japanese. While I intended to include participants from different nationalities, the aim was to include some Japanese participants who have or had some experience with Society 5.0 as the concept of Society 5.0 was created in Japan. With the regard to gender, I did not originally consider gender balance as a selection criterion, as I did not perceive gender to be influential for the interview subject.

Table 2 Participants of the study

	Title of job	Research Area or Industry	Nationality
1	Professor	Green Mobility, Machine & Information	Japan
2	Product Component Owner	Automobile (Autonomous Vehicle)	Malaysia
3	Managing Director	Consulting	Sweden
4	Project Assistant Professor	Smart Aging Research	Germany
5	Distinguished Researcher Ph.D.	Social Innovation	Japan
6	Founder and CEO/ Ex-special advisor to the ministry of ICT	Digital Strategy/Social Innovation	Japan

7	Professor	Environmental Science and Technology	Japan
8	Associate Fellow	Science and Technology	Japan

The interview participant (1) used to be involved in Japan's national program called SIP (Cross-ministerial Strategic Innovation Promotion Program), which is led by the Council for Science, Technology and Innovation (CSTI) of the Japanese Government. The program was launched as scientific and technological innovation is of utmost importance to realise the revival of the Japanese economy and sustainable economic growth (Cross-ministerial Strategic Innovation Promotion Program 2018). Within the program, he participated in the Smart City Project, which is within the framework of Society 5.0, and it lasted until March 2021.

The interview participant (2) has been working and researching autonomous vehicles and robotics as part of Industrial Revolution 4.0's research since 2014. Thus, he has been involved in the technical part. He has been also involved in a public project called Horizon 2020, which is the EU research and innovation programme, and participated in a research project in Japan, whereby he is exposed to the wisdom of Society 5.0.

The interview participant (3) got to know about Society 5.0 through EU-Japan Centre for Industrial Cooperation which deepens the industrial cooperation in the EU-Japan economic area. He conducted research on Society 5.0 and submitted a proposal to write a report about Society 5.0 for the organisation as the organisation is helping small and mid-size European companies to get to know about the Japanese market. The organisation selected his proposal to write a report. He started working on the report in Autumn 2017 and completed it in March 2018.

The interview participant (4) has been deeply involved in the research of Industry 4.0. Since 2005. He has been involved in a yearly workshop between a German organisation and his organisation in Japan, where a person who invented the concept Society 5.0 is also involved. When Society 5.0 was first announced at CeBIT, which is the world's largest technology fair, in Hanover, Germany in 2017, he participated in the fair. At that time, a collaboration between Japanese and German Artificial Intelligence research centres was established when the whole topic of Society was still new. He also used to work in an organisation called The National Institute of Advanced Industrial Science and Technology (AIST), which aims to innovate technologies that can be useful

to Japanese industry and society. In addition, he made a presentation about Industry 4.0 at the German Embassy, where those who were involved in the development of Society 5.0 also presented about Society 5.0 and they made discussions on these two topics.

The interview participant (5)'s organisation has many opportunities to work with the Japanese government. His organisation and the Japanese government co-created the basic concept of Society 5.0. When the government announced the concept of Society 5.0, there were many voices that it was difficult to understand what exactly Society 5.0 was. Therefore, his organisation decided to write a book about Society 5.0 to describe how his organisation interprets Society 5.0. While he was not involved in the co-creation of the basic concept, he was assigned to write the book. Furthermore, his organisation has joint research projects with multiple universities. Regarding the book about Society 5.0, his organisation's employees and professors from the University of Tokyo made discussions on Society 5.0 and co-wrote the book.

The interview participant (6) researched how the U.S., Europe, and China utilize digital for economy and society including the research about Industry 4.0. The research started in 2015 as a member of a governmental agency. As a member of policy making, he was involved in meetings with governments, a business community, and academia to create Society 5.0. Based on the vision Society 5.0, he was also a member of creating policies about various fields including education, manufacturing, and medical. In addition, he was a member of the mission for the CeBIT conference in 2017, where the former Prime Minister of Japan, Shinzo Abe and German Chancellor Angel Merkel discussed Industry 4.0 and Society 5.0.

The participant (7) agreed to contribute to my research through e-mail. He did not describe the touchpoints or experience with Society 5.0. However, he has written and published a journal article about Society 5.0 and his research area includes Cyber-Physical Systems, Internet of Things, Artificial Intelligence, Applied Mathematics, etc.

The participant (8) was not able to participate in the interview but contributed to my research through e-mail. He published a journal about Society 5.0 and is also a speaker/docent about innovation systems.

3.4 Data analysis

In the data analysis stage, the data were categorized into two chapters with four themes, respectively. The categorised themes in both chapters were chosen based on

their relevance to the research questions. The data was analysed to identify valuable insights which can contribute to the understanding of Society 5.0 as shown in Chapter 5. Chapter 6 focuses on approaches towards the realisation of Society 5.0, where both literature review and insights from participants, who contributed to this thesis's data collection, were analysed and reflected. All the recorded interviews were transcribed using two software called Descript and Amazon Transcribe. Descript was used to transcribe the interviews conducted in English. Amazon Transcribe was used to transcribe Japanese interviews as Descript is only available for English. As the first phase of data analysis, the transcripts were read thoroughly with the recordings to fix the errors and make the transcripts complete. At the second phase of data analysis, keywords were highlighted, and themes were identified. The themes which stood out the most and are most relevant to the research questions were selected. In both Chapters 5 and 6, data was analysed and reflected based on the theoretical framework and the literature to identify interesting and meaningful insights. The aim of the data analysis was to identify the emerging insights which were not covered in the literature review and to gain better understanding about approaches and potential solutions which are driving towards the realisation of Society 5.0.

4 KEY FINDINGS FROM THE EMPIRICAL MATERIAL

In this chapter, the research question “How does Society 5.0 differ from Industry 4.0?” is answered by combining the observations gained from the literature review and data gained through empirical analysis. In addition, other key findings which emerged from the empirical study are also discussed in this chapter. One of the aims of this thesis was to understand better the concept of Society 5.0 by comparing it with Industry 4.0 and to analyse the problems and issues that led to the creation of the vision. The combination of theoretical observations and empirical data enhanced the understanding of the concept and the assessment of the problems and issues.

4.1 Industry 4.0 and Society 5.0

As Industry 4.0 is often discussed in most of the literature about Society 5.0, there are distinct similarities and differences between these two concepts. As the main similarity, both put an emphasis on the utilization of technologies, including AI, Big Data analysis, and IoT technology, enabling cyber-physical systems (Deguchi et al. 2020, 17-19). Therefore, technologies that emerged in Industry 4.0 are leading towards Society 5.0. When participants were asked, common answers emerged from interviews and written responses. The most prominent similarity was the advanced fusion of cyber-physical systems:

"The digitalization technologies (AI, IoT and other cutting-edge technologies) are the same. These technologies are being further developed over time with more advanced capabilities and are included in further applications. " (Interview participant 3)

The most distinctive difference between Industry 4.0 and Society 5.0 is that Industry 4.0 is centred on the manufacturing sector deploying the cyber-physical system, whereas, in Society 5.0, the cyber-physical system is deployed across all industries, society as a whole (Deguchi et al. 2020, 19). Thus, the scope of applying the cyber-physical system is much broader in Society 5.0 than in Industry 4.0. Furthermore, the objective of each concept is different. While Society 5.0 aims at solving multiple societal issues and envisions a future society with social benefits, Industry 4.0 focuses on the much narrower domain, where increased productivity and minimized manufacturing cost are the objectives (Deguchi et al. 2020, 20-21). In other words, the wellbeing of

people is the core part of Society 5.0, and the focus of Industry 4.0 is on the revolution and disruption of technology:

"Industry 4.0 focuses on modernization and productiveness but society 5.0 focuses more on the wellbeing of people in the society. " (Interview participant 5)

"Society 5.0 will integrate digital transformation introducing new solutions to social challenges in society. It is the shift from technology first to humans first. " (Interview participant 3)

4.1.1 Technological unemployment through automation

As discussed in Chapter 2.2, multiple pieces of literature about Industry 4.0 often address the threat of technological unemployment accompanied by the advent of disruptive automation enabler technologies. On the other hand, the threat of technological unemployment is not discussed in the pieces of literature about Society 5.0, whereas the issue of the shrinking workforce arisen from the population ageing and low birth rate is often discussed.

Among such disruptive technologies, it is said that AI is poised to be the one that accelerates the technological unemployment. Highly educated and better-paid workers might be more vulnerable in the future, according to some researchers. In the legal field, AI was tested to determine if the repetitive tasks could be automated since some types of contracts such as employment conditions deal with simple tasks. However, it did not turn out to be as effective as it was expected initially. Therefore, it reached the conclusion that making a system in which AI works with lawyers is better and more efficient rather than replacing them. (Burgess 2021, 120-122). Like this case in the legal domain shows, when technologies are created and deployed in a way that they augment and shape the conventional processes rather than taking over them, society may benefit the most, and this seems to be more compatible with the vision of Society 5.0.

The reason why technological unemployment is often discussed in the context of Industry 4.0 could be related to the difference in the social attitudes towards technology depending on the countries. One of the interview participants addressed as follows:

"In Germany, people are a little bit critical about Artificial Intelligence because there's also a lot of fear that it can very simply take away their jobs. In contrast to that, I think in Japan, there is not this fear about Artificial Intelligence. I think the difference is also culturally that in Japan, AI is nothing bad, but in Europe, maybe people are more careful about that. " (Interview participant 4)

In Japan, social robots, which can help elderly people, are already used and this could receive more demand in the future as the country holds the most rapidly ageing population in the world (Burgess 2021, 121). This indicates that the adoption of emerging technologies will probably vary around the world depending on each country's culture and perception of the technologies. Since Germany is the leading country, which is attempting to promote Industry 4.0, the discussion of technological unemployment may be often brought up due to their culture and social attitudes towards new technologies. On the other hand, Japan seems to be more open about accepting robotics and AI in general, while some still raise the fear of technological unemployment. Hence, it seems that the positive sides of the use of new technologies are described in Society 5.0 and are heavily promoted to deploy them.

Overall, the empirical data indicates that technological unemployment is not a major issue in the context of Society 5.0, and it may not develop into a long-term issue by adopting certain measures. Additionally, one of the interview participants addressed the importance of supporting and protecting the rights of foreign workers in Japan:

"The issue that people lose their job due to excessive automation is often discussed but the issue in Japan is the lack of manpower due to the shrinking population. At the moment, Japan makes a stand that it does not officially accept a large number of immigrants. Meanwhile, the labour in Japan is supported by temporary workers from Asia, especially in the agricultural and manufacturing sectors. They come every year as technical trainees. We need to find a balance between encouraging the adoption of automation and supporting those workers from Asia. " (Interview Participant 5)

"Technological unemployment can be a factor that could threaten human wellbeing. However, it will be possible to prevent it from developing into the long-term and aggravating the issue by supporting and facilitating the shift to the newly created jobs. " (Participant 8)

"Industry 4.0 holds the issue of what is going to happen to workers in the manufacturing sector with the advent of a very high degree of automation. However, technological unemployment is not the focal point in Society 5.0 as Society 5.0 takes into account not only the labourers but also all beneficiaries including citizens. " (Interview Participant 6)

To sum up, although it would be important to create a safety net for the labourers who may lose their jobs due to the development of technology, what matters could be the facilitation for the newly created jobs and how we train people for such new jobs which currently does not exist. As indicated in the next sub-chapter 5.2's Figure 7, many citizens in Japan are afraid of the future that robots take over the jobs of humans. However, technological unemployment is nothing new and has been happening around the world as being pointed out by the interview participant 1. He continues that it should surprise no one that technological unemployment can happen to some extent for certain fields. Therefore, rather than viewing it as a negative consequence of technological advancement, seeing it as a new opportunity to make a shift towards new jobs which brings novel values to society may take a significant step towards the realization of Society 5.0.

Table 3 Differences between Industry 4.0 and Society 5.0

	Industry 4.0	Society 5.0
Technology	Digitalization technologies (AI, IoT, and other emerging technologies)	
Scope	• Narrow • Manufacturing sector	• Broad • Society as a whole
Objectives	Modernisation and productiveness	Human well-being and resolution of social issues
Key threat	Technological unemployment and technological singularity	Shrinking workforce accompanied by ageing population
Key opportunity	Greater efficiency and convenience	Solutions and future of the society co-created

4.2 Fear of technology as one of the main factors to create Society 5.0 vision

There seem to be multiple factors that have led to the creation of the Society 5.0 vision. They include social and environmental issues such as shrinking population, environmental degradation, ageing industrial infrastructure (Holroyed 2020, 7; Matsuoka & Hirai 2020, 28-29; Fukuda 2020). One of the interview participants addressed a technological perspective, which is the fear of technology. With regard to the fear of technology, only centring on the development of the manufacturing sector through the adoption of advanced technologies, which Industry 4.0 envisions, does not solve the issue, as described by him. Considering how the future of society as a whole may evolve is crucial to respond to the issue since the technology will be highly integrated into every aspect of social life and every industry rather than just a manufacturing sector.

" [The Japanese government] started discussing the creation of the vision Society 5.0 around 2015 in order to address the fear of technology which has been mounting not only in Japan but in the world since around that time. [---] That is, there was a growing perception among the citizens that society might be heading towards a negative direction because of the technology. " (Interview participant 6)

Meanwhile, it seems that it is evident that the concept of Society 5.0 has not been fully delivered to the general public if one of the objectives of the Society 5.0 is to mitigate the fear of technology and transform society in a positive way with the use of the emerging technologies. The picture below indicates what kind of fear Japanese citizens have as Society 5.0 is materialised. All of the answers are related to the fear of technology and the fear resulting from the data related issues. This is the translated version of the survey result, which was originally conducted in Japanese by an institute called NISTEP, National Institute of Science and Technology Policy. According to NISTEP, 3000 people participated in the survey on the Internet in March 2019. The institute is under the direct jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and it is involved in the science and technology policy planning of the Japanese government. (NISTEP, n.d.).

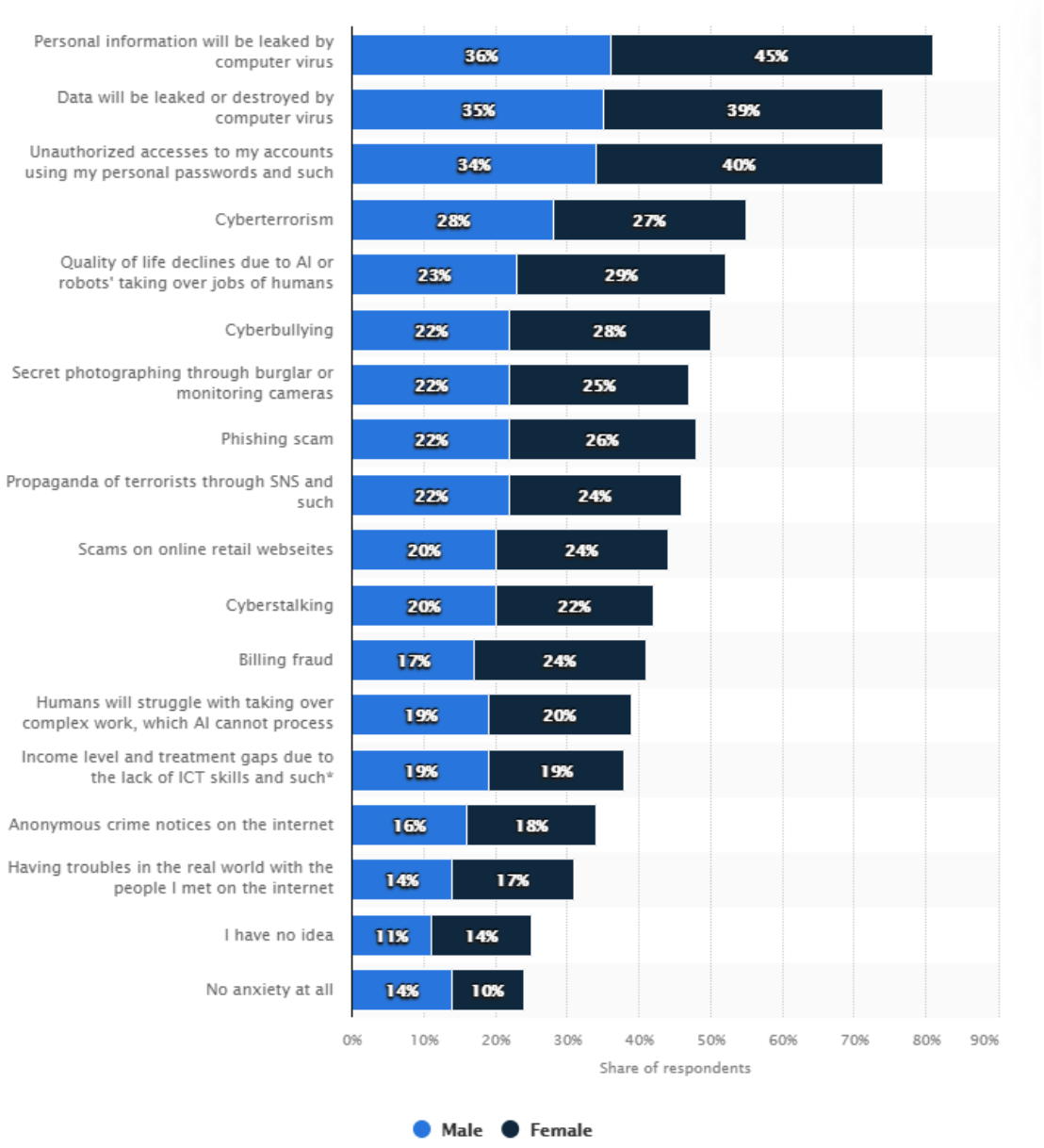


Figure 7 (Statista 2019) Reasons why people feel anxious about the realization of Society 5.0 in Japan as of March 2019, by gender.

All of the anxiety expressed by the survey participants will appear as threats in the realization of Society 5.0. Additionally, as the Society 5.0 seems to be promoted heavily around the technology, such as the concept of smart city and how the technology can help solve the societal issues, it is quite conceivable that fear of technology will certainly persist whatever the utopian society can be depicted in the Society 5.0. However, the important thing is what kinds of approaches are needed to minimize those potential threats. It will or should become one of the core parts in the realization of Society

5.0. As discussed further in sub-Chapter 6.1, devising the technological regulations and laws will be crucial to the development of technology. Before solving multiple societal issues, overhauling the regulatory framework will be one of the essential elements to be prioritized. Furthermore, the main actors who are responsible for spreading the vision of Society 5.0 will need to deliver the right message to the general public about what kind of approaches to be taken to realize the future of desirable society described in Society 5.0.

4.3 Applicability of Society 5.0 around the world

In this chapter, the interview data highlights if the concept of Society 5.0 is applicable not only in Japan but also in other countries. In addition, the participants were also asked to describe if other countries may incorporate Society 5.0 in their own national strategies or implement it as a model vision. All the participants answered that it is applicable in any country. However, three of the interview participants expressed that most likely, it is a matter of time axes for developing countries since a country need to achieve a certain level of economic development before being able to implement the concept of Society 5.0. As the technologies used in Society 5.0 includes those cutting-edge technologies, including AI, IoT, and Big Data analysis, which are also used in Industry 4.0 (Deguchi et al. 2020, 19), the level of economic development will be one of the key elements in order to deploy those technologies. Therefore, the concept itself will be applicable elsewhere in the long term, depending on the level of technological development.

However, when it comes to if other countries are willing to apply the concept of Society 5.0, it will vary. As Holroyd (2020, 3) discusses, technology is a core means of transforming and improving society in the idea of Society 5.0. The primary focus is to respond to societal needs and issues rather than following how society changes through technological advances (Holroyd 2020, 4). Thus, it requires the capabilities to actively apply the technologies as a means to meet societal needs and solve societal issues. As one of the interview participants describes, how people use the technology is important in the concept of Society 5.0:

"In the future, even in underdeveloped countries, [how they figure out] how to deal with these changes of technology, how the people in a rural area will interact with all of this technology, [---] They have this technology that they can use [to meet societal needs]. " (Interview participants 2)

Hence, Society 5.0 is centred on society and human well-being rather than the technology itself (Deguchi et al. 2020, 4). In summary, it seems that a country, which applies the concept of Society 5.0, cannot passively wait for or follow how technologies change society. Furthermore, as further discussed in Chapter 5.2, it will be critical to determine if countries are willing to solve societal issues which cannot be measured by the economy such as GDP and profits. Those societal issues may include, for example, the improvement of ecological systems and disaster preparedness as they are crucial for the fundamental of human wellbeing.

On the other hand, if other countries are willing to implement the concept of Society 5.0 will depend on if Japan, which has developed the concept, can demonstrate concrete approaches Japan is currently taking to achieve Society 5.0. As one of the interview participants pointed out, without demonstrating concrete application examples, it would be unlikely for other countries to take the concept of Society 5.0 seriously and implement it:

"Japan does not have an ability to disseminate Society 5.0 to the world. On the other hand, Europe has the ability in this regard. For example, people are very committed to realising Industry 4.0. [---] We need some examples of Society 5.0. Just presenting the concept is not sufficient for other countries to be willing to apply the concept. We need to demonstrate examples. And we need to develop the ability to disseminate them to the world. " (Interview participant 6)

4.4 From Top-Down to Bottom-Up approach: Main actors for Society 5.0

When it comes to who takes the responsibility to implement Society 5.0, the Japanese government, which has created the concept of Society 5.0, may be the main actor. Other actors may include large corporations which are the members of the Japan Business Federation (Keidanren) and academia. Indeed, they will be the ones who are

responsible to proactively promote the concept to the public and implement it in various fields of industries and society as a whole: applying the state-led or top-down model with the approach by government or large corporations. Meanwhile, it is questionable if the state-led or top-down initiative is aligned to the concept of Society 5.0. Since Society 5.0 aspires to create a human-centred supersmart society that serves diverse needs (Deguchi et al. 2020, 19-20), active civic participation will be also crucial in the implementation of Society 5.0. Therefore, both top-down and bottom-up approach is expected to be taken to meet the concept of Society 5.0:

"All stakeholders who are involved in the human wellbeing have the responsibility to implement Society 5.0. However, in the initial stage, those who know well about the concept of Society 5.0, such as government, large companies, and academia, have the responsibility to encourage the participation of start-ups, small-middle sized companies, and citizens." (Participant 8)

According to Yuko Harayama (2017), who participated in the creation of the concept of Society 5.0, in order to facilitate Society 5.0, not only the government but also the different organisations need to foster their cooperation, breaking down “silos” of organisations and enhancing open innovation. Breaking down the silos of organisations means that it is essential to be involved outside of one’s domain to spark new ideas which could lead to innovation. (Harayama & Fukuyama 2017.) Some of the interview participants also stated the significance of collaboration between different industries and organizations. In an increasingly turbulent world, it seems that there is a limitation that one organization can do to reach desirable outcomes:

"Collaborations between companies are needed to create a new ecosystem. Just one company cannot do it. Everyone needs to sit together and basically work. Maybe there is some effort like alliance within the industry to be creative and to discuss what is the correct way to create the society." (Interview participant 2)

Most of the participants addressed the importance of civic participation. In order to address the examples of civic participation, smart city initiatives around the world are discussed here. Smart city initiatives are often discussed in the pieces of literature about Society 5.0. The smart city is often described as urban planning integrated with Information Technology. There are numerous examples of smart city initiatives around the

world that where Information Technology is integrated into urban community services or where services or new business opportunities are created by using Information Technology. (Deguchi 2020, 44.) The key issue is that the smart city initiatives are often driven primarily by technology with the introduction of emerging technologies and systems as well as by either by private organizations or public institutions (Deguchi 2020, 56; Cardullo & Kitchin 2019, 1.) While the use of technology and the organization-led model are essential in a smart city, it needs to be oriented more towards what Society 5.0 envisions. Merely relying on a technology-led and top-down model would not be sufficient to respond to the issues that urban populations generally confront. (Deguchi 2020, 56). To this end, a new approach is needed for smart city initiatives: the civic participation model. Thus, a real boost is likely to come from civic participation.

For example, some cities in Europe are implementing the citizen-led model for smart city initiatives. One of the major examples is Barcelona in Spain. Since May 2015, the city has shifted its vision of a smart city initiative towards a citizen-centric approach. Thus, Barcelona has transformed the initial approach which seeks private interests into a model based on civic movements and social innovation. (Cardullo & Kitchin 2019, 11.) As two of the interview participants raised the case of Barcelona as an example that can be applied towards the realization of Society 5.0, civic participation is expected to be the central part to be compatible with the vision of the people-centric society depicted in Society 5.0:

"Smart city is one of the key terms in the vision of Society 5.0, which society as a whole is digitalized. As an approach, citizen's participation is important. For example, Cloud law, where many people participate in creating a law is one example. Like cloudsourcing and cloud funding, not just experts but everyone participates and change law. Decidim originally from Barcelona, which is a digital and democratic platform for citizen participation to empower them to decide the future of the society, is another example used in its smart city initiative. Citizens participate in changing society, engaging in policy making and law creation using technology. Europe and Taiwan are leading in this field." (Interview participant 6)

Now the future is uncertain. The change is happening every day. So co-creation is needed. So maybe, it is the responsibility of everyone, not only the government, but also the industries, startups, academia, and citizens. (Interview participant 2)

"Convenience is often discussed in the context of Society 5.0. For example, drones will deliver the package to you, or cars will come to you without waiting but even if society becomes more convenient, it does not necessarily mean that people are happy. Citizens should take an initiative in solving problems and participating in, for example, improving infrastructure. " (Interview participant 5)

In a summary, it seems that the government is the one who should take the main responsibility to promote the vision of Society 5.0 to the general public in the initial stage. Other stakeholders such as large companies and academia which are familiar with the concept of Society 5.0 should also take responsibility to encourage and empower startups, small-medium sized companies, and citizens to participate in the creation of a people-centric society. In addition, collaboration between different companies, governments, industries, and academia is needed. Therefore, a state-led and top-down model will be taken initially. At the same time, the bottom-up model led by the citizen-centric approach is expected to be the main driver to transform the society towards fully people-centric.

5 KEY FACTORS SHAPING THE DEVELOPMENT OF SOCIETY 5.0

In Chapter 6, the second research question "What are the key factors shaping the human-centred society illustrated in Society 5.0?" is answered by combining the initial literature review and the empirical data. In order to respond to this question, theoretical observations and key findings in Chapter 5 were taken into account. Moreover, the current issues and potential threats and challenges were identified to assess and shape the approaches to attain the positive societal transformation. In an attempt to present key factors which could be considered and integrated into policy and strategy making, a general PESTEL table was created below through the findings from the interviews and the literature review. PESTEL analysis explores political, economic, social, technological, environmental, and legal factors affecting an issue. It is a useful strategic tool to determine the external environment that has implications for the issue. (de la Rosa et al. 2019, 219.) Based on the PESTEL analysis, this study aims to determine which factors affect the realisation of Society 5.0, and the key factors which may influence the direction of the realisation of Society 5.0 were identified and discussed in the following subchapters respectively.

Table 4 General PESTEL table showing potential key factors to shape Society 5.0

PESTEL		
POLITICAL	**ECONOMIC**	**SOCIAL**
- Funding in STEAM education to create interdisciplinary knowledge. - Even if the leading political party changes, the government takes responsibility for leading the promotion of Society 5.0 for the initial stage. - Balance between automation and acceptance of foreign workers	- Companies need an ability to incorporate the interests of multi-stakeholders for mutual benefit, which can have a positive impact in the long term. - Transformation from the top-down system to the bottom-up system. - Investment in venture capitals to stimulate innovation.	- Collaboration among universities, industries and governments to update academic programs which are compatible with Society 5.0. - Co-creation between multiple parties to create and deliver the products and services which are centred on human wellbeing. - Promote civic participation model. - Social innovation with the use of digital tools and civic participation. - Fostering information literacy among the citizens.
TECHNOLOGICAL	**ENVIRONMENTAL**	**LEGAL**
- A new platform or technology that can better protect and decentralize data - Promotion of civic tech such as creating a website by civic engineers and opensource it to spread to other areas or countries.	- Disaster management or green infrastructure using AI and information and communication techniques such as crowdsourcing and information sharing. Beyond GDP, environmental aspects of progress are one of the potentials to realise Society 5.0.	- Co-developing regulatory framework for the positive development of emerging technologies. - Promoting Cloudlaw where many people including citizens participate in creating laws.

5.1 Ethics of AI

The development and implementation of Artificial Intelligence (AI) is defined as one of the central pillars for the creation of Society 5.0. Among different strategies for AI, ethics and regulation of AI development are especially taken into consideration. The U.S. tech giants such as Google, Facebook, Amazon, and Apple have been reported to collect and exploit immense amounts of data, expanding their presence elsewhere. Additionally, it is likely that the Chinese giants such as Baidu, Alibaba, Tencent have been providing the collected customer data to the government. Hence, the importance of data sovereignty and data sharing rules have been increasing around the world. (Fukuda 2020, 2.)

Since the ultimate aim of Society 5.0 is to create a human-centric society and enhance human well-being, technology should not develop in the direction where technology makes people increasingly more unhappy or technological singularity becomes a reality. Technological singularity refers to a state where the advances of technology, particularly artificial intelligence, exceed human intelligence, which is predicted by a futurist, Ray Kurzweil that it could happen by 2045 (Goertzel 2007, 1165-1166). This could happen when the ultimate goal of some researchers, artificial general intelligence (AGI), becomes widespread in the society. AGI would be capable of performing all the given tasks excellently equipped with full human capabilities. Some researchers and people in AI community warned that AGI would be a bigger threat than nuclear weapons and the existence of human civilization would be exposed to serious risk. (Burgess 2020, 161-162). Some of the interview participants also raised the concerns towards the technological singularity. It is possible that the development of AI eventually leads to the point that AI starts recognizing humans as the unnecessary creature which cause harm to Earth:

"The development of AI is accelerating. And there will be a time when AI is more intelligent than people. The question is what will this AI do? What kind of goals or ideas does it have, and does it take the same as we are? If this AI has the idea that the planet has a big problem and that's because of humans who has been causing a lot of troubles, then AI might think that the planet without humans is much better. If such superintelligent AI emerges, then it might be impossible to stop it. " (Interview participant 4)

As discussed in sub-Chapter 5.2, the data shows that many people in Japan have some concerns about the development of technology. Although the probability of a general technological singularity, which was addressed by interview participant 4, could be low, it does not mean that the probability of occurrence is zero. Thus, in order to prevent such a dystopian scenario and lead to the society envisioned in Society 5.0, a global consensus and regulation would be urgently required to build AI and other emerging technologies.

The ultimate threat, which might evolve due to the development of AI, might be determined by the people who create and design AI. In addition to the ultimate threat, ethical aspects such as gender, sexual orientation, ethnicity, age need to be taken into consideration. One of the things which would really matter would be who is developing and shaping the AI system since the ethnic and cultural background and assumptions of people who develop AI could skew the creations. In fact, a great majority of AI products are being created by white men. Moreover, 80 per cent of professors who are specialized in AI consists of a male, according to a study done by the 2018 AI Index. This indicates that the AI industry is urged to make structural changes to address the lack of diversity. (Burgess 2020, 142-144). The lack of diversity might lead to the consequences that extremely biased decision by AI becomes increasingly prevalent. One of the interview participants raised an example of such potential biased decision:

"AI has been already used partially in a court in the U.S. for a judgement and in a bank in Japan when making a loan. There might be a difference in judgement depending on the regions you live in, gender, and race since it is clear that bias of algorithms already exists. " (Interview participant 6)

Currently, there is widespread uncertainty about the application of AI. Regulators need to inspect algorithmic decision systems to tackle a lack of transparency. In order to assess AI systems, considering how AI impacts society before or after it is in use could be one of the key factors which may need to be taken into account globally. Furthermore, in the absence of legislation around the world, AI systems that are exposed to discrimination and biases are used globally. In New Zealand, the government unveiled a set of standards for algorithms in decision-making. The set of standards include the pledge for transparency about how government agencies make decisions using algorithms and a regular peer-review on algorithmic decision-making systems (Burgess

2020, 154-156). While some movements towards setting a standard for AI systems exist in some countries like New Zealand, it seems that the world still significantly lacks the legislation and standards regarding responsibility and transparency to develop them. On the other hand, there is also a challenge that a country that set a strict standard for AI systems may lose the global competition of developing technologies as one of the interview participants addressed. Since the world is facing a fierce tech race to bring new technologies to the market, researchers or developers are inclined to think about ethics after some problems related to them occur:

"Who takes responsibility for such biases in algorithms? Developer? Service provider? Government? There's no social consensus about ethics. Some AI researchers or developers argue that if we consider ethics, we cannot do research or develop anything. And some AI developers consider that those who use the technology has the responsibility. However, for example, some banks say developers should have the responsibility. Thus, there are lots of arguments over who takes the responsibility for biases in AI algorithms." (Interview participant 6)

"We should have some regulation against developing AI, and we should have some ethics. With all the technologies, I think it will be impossible to stop the development. Somebody will do it. Maybe they don't care. And we cannot really stop. Some frameworks should be created which is used in a positive way. " (Interview participant 4)

Based on the answers derived from the interview, some regulatory frameworks for developing new technologies including AI systems need to be created. Otherwise, not only the issues of biases and discrimination but also the extreme case of technological singularity may also eventually become reality. In such a situation, dealing with the aftermath of issues would become uncontrollable and disastrous. Although at present countries tend to develop technologies without considering the consequences, which they have to the society, due to the intensifying global tech race, setting a framework and guideline will be of importance to lead to the positive development under Society 5.0.

In addition to the creation of frameworks and standards, Burgess (2021, 160) also states that everyone including regulatory bodies, developers, and the users of AI or the citizens should be involved in its development in order to create AI which can bring a benefit to all. Since the users of AI or the citizens are the ones who would be most

impacted by AI, a project or a system in which people can disclose how AI has been treating them may be required to include the people in the designing process (Burgess 2021, 160). One of the interview participants also emphasized the importance of everyone's participation in the creation of AI systems:

"If everyone is involved in the process of assessing what kind of responsibility should be taken for the stakeholders and how they can be reflected in the research policy and the company's policy, it can increase the trustworthiness for the use of AI. If not, we cannot use it without fear. " (Interview Participant 6)

To sum up, at present the world lacks legal frameworks for ethically developing AI systems. While the current AI is still in its infancy and cannot work across multiple different domains yet, some sort of framework needs to be created in advance, considering the rapid advancement of technologies. In addition to that, it seems that it is everyone's responsibility to be involved in the designing process of the AI systems in order to develop them into reliable, transparent, and beneficial ones. AI will play a significant role in accelerating the realization of Society 5.0, only if it is developed in a way that has a positive impact on society. Therefore, developing ethical AI would be one of the crucial factors to lead the development of Society 5.0 in a positive way.

5.2 Social innovation

As discussed in sub-chapter 2.3.5, social innovation may play a key role in demonstrating some examples to attain the vision of Society 5.0. As social innovation is concerned with social needs that were not taken into consideration previously and aims at empowering all stakeholders including citizens, this approach could accelerate the realisation of Society 5.0, accompanied by the use of emerging technologies. Social innovation aligns with the idea of Society 5.0 which transforms and improves the society by the use of new technologies, rather than passively following the development of those technologies.

The participation of society in innovation processes has been around for a long time. However, potential engagement levels and modes have tremendously risen during

the past two decades. The impact of globalization and digitalization on society is very high as individuals have gained more abilities to actively engage in co-creating and implementing innovations through the development of both globalization and digitalization. (Windrum et al. 2015, 153.) The interview participants acknowledged that social innovation can be one of the key pillars and examples to demonstrate for Society 5.0. Since three out of eight participants had the background of researching social innovation, it may be only natural that social innovation was addressed as a possible enabler for Society 5.0. Nevertheless, given the characteristic of social innovation that it is powered by enhancing inclusion and well-being rather than pursuing economic profit, empowering citizens, and co-creating innovations through multi-agents and multilateral networks to develop multiple solutions to respond to social challenges (Windrum et al. 2015, 151-153), it seems that social innovation can be expected to be one of the crucial factors to be included to the discussion to expedite the realisation of Society 5.0.

"Social innovation is nothing new. But the difference between the current social innovation and the previous one is the extent of possibilities. With the widespread use of the ICT technology, we can now solve social issues which were unable to solve before." (Interview participant 1)

"Social and environmental aspects of progress, which are not included in the measurement of the economy such as GDP and profits, can hold great potential to realize Society 5.0. Disaster management or green infrastructure with civic participation and the use of ICT technologies are examples of opportunities for Society 5.0 by creating a richer ecosystem. " (Interview participant 6)

As interview participant 6 stated, disaster management such as building resilient mountains or rivers against disasters seems to be one of the ways to tackle social issues as well as enhance human wellbeing. While disaster management is particularly essential in Japan which is prone to have a wide range of natural disasters such as earthquakes, tsunami, flooding, typhoon, etc., it will become increasingly important even in countries or regions which currently do not have any major issues. This is because it is expected that the frequency of extreme weather events increases significantly around the world due to climate change. Therefore, disaster management could become one of the examples to demonstrate in Society 5.0.

In addition, thanks to the advancement of the ICT technologies such as crowdsourcing and information sharing and the emergence of AI and big data, social innovation is entering a new sphere. Therefore, social problems, which otherwise could not be solved before, is currently possible to solve, as raised by interview participant 1. Crowdsourcing stands for a data collection and analysis approach by accumulating the thoughts of a large group of people, which can be cost-effective and time-efficient in the event of a disaster (Fan et al. 2021, 3-4). As discussed in Chapter 5.4, the example of Decidim platform from Barcelona seems to deploy part of the crowdsourcing approach by promoting civic participation in order to co-create the future of society. Therefore, the new modes and levels of social innovation with the use of digital tools and civic participation are likely to hold tremendous opportunities to address social issues and help create a people-centric society through the active participation of citizens.

Furthermore, many of the interview participants pointed out the importance of information literacy in order to shift towards a truly human-centric society. As the development of information technology accelerates, each and every citizen is required to foster information literacy, rather than being passive and reluctant to learn about technologies and their systems. If the level of information literacy is low among citizens, it would be challenging to encourage them to engage in social innovation which reaps the benefits of new digital tools equipped with cutting-edge technologies. The low level of information literacy could also become a significant obstacle for the realisation of Society 5.0. While civic participation is the core part of the realisation of Society 5.0, without a certain level of information literacy it is likely that it does not reach the desired point which is envisioned originally:

"The level of information literacy among citizens is quite low. They lack a proper understanding of what kind of characteristics an information system has. The issue is a lack of consensus and common sense regarding how the future of society should be and how information systems should be created. Without such understanding, even if we create a good services or products, they may not be selected. There are many people who just avoid learning, but they should have some understanding about how infrastructure, which act as a secure foundation for society, is created and what kind of characteristics, strengths, and problems it holds. " (Interview participant 1)

"Citizens should not perceive AI as a black box. They need to understand algorithms in order to actively participate in, for example, policymaking and co-create future of society. " (Interview participant 6)

5.3 From data monopoly to data democratization

The examined literature indicates that data-driven society plays a decisive role in understanding Society 5.0 (Deguchi et al. 13-14). As described in Chapters 4.4 and 5.2, civic participation through a digital tool is expected to be crucial to accelerate progress towards Society 5.0. This also includes that citizen is required to provide data actively rather than passively in order to customize certain products or services in a way that benefits them the most and eventually co-create the desirable society. Likewise, Big data, a vast amount of data on such as customer's shopping history or sensor data gathered, analyzed, and extracted, will increasingly be used to develop services where personal data is crucial. Not only for marketing purposes such as an analysis of shopping histories but also in a variety of sectors, Big Data analytics are conducted. (Shibasaki et al. 2020, 76). It seems that we are entering the era of personalization with the use of data by identifying the preferences, trends, and tastes of people. While this brings numerous benefits to multi-stakeholders, privacy concerns are emerging as an immense issue.

"The current successful business model is data monopolies by tech giants, where the use of people's data is essential to provide services. They provide interesting services using billions of people's data, but the issue of privacy is constantly growing." (Interview participant 6)

It is perhaps reasonable to say that people will provide data actively only under the condition that they can entrust their personal data to the third party. At present, the issue of data privacy is reportedly immense around the world as seen in an example of the rapidly increasing data dominance and the concentration of wealth of the big tech giants such as Google, Amazon, and Facebook. Since the environment where people can share data with peace of mind is crucial under the data-driven society, addressing the challenge of data privacy is an indispensable element. The interview participants

also shared concerns about the data privacy issue and the concentration of personal data in hands of tech giants. They expressed the importance of sharing data while protecting data.

"It is important to create a society where data can be shared widely, rather than just a handful of tech companies occupy data. " (Interview participant 5)

"We are moving towards Big Data, so there are so many data about everything. And so that gets really a lot. And you have to look at the data protection. " (Interview participant 4)

"In Japan and Europe, data is basically ours according to the law, and we should share data based on that. Data should not be centralized by governments or big tech companies. Democratizing and decentralizing data is going to play a key role in Society 5.0. " (Interview participant 6)

In order to allow organizations to utilize personal information while protecting data privacy, creating a new platform or introducing new technology could be one of the options so that people may be more cooperative to give their consent to their data use and open up multiple new possibilities for the use of data (Shibasaki et al. 2020, 72). For example, Europe is putting a lot of effort to disperse the concentration of data from international tech giants in the US (GAFAM) and China (BATX) by launching a project called Gaia-X. In the US and China, laws for data ownership, data analysis and privacy are significantly different from the ones in Europe. Therefore, organisations in Europe often struggle to protect their data using the platforms of those international tech giants as storing and processing the data will be conducted on a server in the US (or China), where different data laws are applied. Thus, Europe is pushing for a creation of a platform where data exchange among various industries becomes much easier and safer by being protected by the European data laws. (Braud et al. 2021, 4; Hughes 2020.) The interview participants also emphasized the importance of creating such platforms and gain data sovereignty.

"Creating a platform where citizens feel safe to share data could be one of the vital approaches to expedite progress towards Society 5.0. The example includes technology that encrypts personal data so that the anonymity of the data owner can be kept. This

kind of technology already exists in Japan, but it is still in its infancy. It is currently used partially in the medical sector. " (Interview participant 5)

To sum up, it seems that the creation of an innovative and new platform for data ownership and privacy could be one of the central themes to be discussed in light of Society 5.0. If people can share data in a more secure way, they could be more inclined to actively provide data, contributing to fostering, for example, social innovation. However, it is also noteworthy to mention that it may be not so easy to build such platforms. Considering our current dependence on the platforms of tech giants, there is also a risk that their platforms are in the end much more superior to new platforms. Interview participant 4 also expresses the concerns that Europe and Japan lack the capability of creating a platform that can disrupt the current dominant platforms. However, taking into account the current movements towards data sovereignty, it can be concluded that a new platform or technology that can better protect and decentralize data is one of the crucial factors shaping the development of Society 5.0.

6 DUSCUSSION AND CONCLUSION

6.1 Discussion

The results indicate that more emphasis needs to be placed on the inclusion and collaboration of multi-stakeholders in order to realise the common future vision and design the society that can benefit all. The identified potential factors that will shape the development of Society 5.0 include the co-creation of legal frameworks for AI, the potential of social innovation as one of the concrete examples of Society 5.0, and the development of technology or frameworks for advanced data sharing and data decentralisation. All of these factors involve the collaboration of multi-stakeholders. In particular, it seems that civic participation plays a decisive role in the development of Society 5.0. However, as many of the experts pointed out, citizens will be required to foster the understanding of the impacts of emerging technologies, algorithms, and mechanisms of societal systems. Thus, increasing the level of information literacy among citizens seems to be a fundamental factor to have a truly meaningful contribution from citizens and in turn lead to the realisation of the shared vision.

The results of this research contribute to increase the understanding of how Society 5.0 can be co-developed as a positive societal transformation by providing the key factors that may shape the development of Society 5.0. The results also indicate the potential future risks and threats which may hinder the positive development of Society 5.0, including the consequences of lack of ethical frameworks for AI, absence of civic participation, and the continuation of data monopoly.

This research is also subject to some limitations considering the literature review, the research methodology, size of the sample, research participants, analysis and interpretations. Since Society 5.0 is rather a broad concept compared to Industry 4.0, this research took a wide perspective. On the other hand, it also did not cover all aspects in depths, ranging from smart city initiatives to the relations between Society 5.0 and sustainable development goals. The literature review was conducted before the empirical part of this research in order to understand the contextual background of Society 5.0. This allowed for preparing better for the interviews and being confident to have interviews with experts who have or had experience of being involved in the project or the creation process of Society 5.0. However, the topics covered in the literature review can be limited and does not include all the topics which may appear in some pieces of litera-

ture which discuss Society 5.0. Therefore, this research covers some aspects of Society 5.0, which were considered the most important and relevant based on the literature review and the empirical research. Several limitations are discussed as follows.

First, the topics covered in the literature review were reflected for the interview questions, that is, the interview questions are based on the findings and interpretations from the literature reviews. However, not all topics covered in the literature review necessarily match with the answers from the research participants or some of them did not raise the topics covered in the literature review. For example, while the shrinking workforce accompanied by the ageing population is identified as one of the key factors which led to the creation of the concept of Society 5.0 from the findings through the literature review, many of the research participants did not go deeper into the topic of the shrinking workforce and ageing population while some of them address as one of the key factors which led to the creation of Society 5.0. This question was included in the second question among all the question lists for the research participants. Regarding this particular question, technological perspectives were emphasized more rather than social perspectives. Additionally, some interview participants spent more time answering other questions. This could be because answering the question needed the extensive literature review of Society 5.0 and it was sufficient for the researcher to answer the question only based on the literature review. Still, some insightful answers emerged by asking this question and significantly contributed to Chapter 5.2 as one of the key findings.

Second, as Society 5.0 is the vision originally created by the Japanese government, it is questionable if other countries are willing to apply the vision to their own strategies. Like Germany coined the term, Industry 4.0, many other countries have also created their own national visions such as “Made in China 2025” and “Vision 2030” by some Middle Eastern countries. It is possible that the Japanese government got inspiration from those visions from other countries or was urged to create the national vision in order to gain competitiveness in the intensifying global tech race. Therefore, when it comes to the applicability in other countries, rather than applying the exact same vision to their own national strategies, other countries will challenge the vision of Society 5.0 or apply it with different terms by following the similar direction with Society 5.0. In addition, as one of the interview participants pointed out, Society 5.0 may not be promoted and fade away if Japan experiences a transfer of power to a new administration in the coming years. Society 5.0 was created during the Abe administration. As the new Suga administration started in 2020 is about to end in autumn 2021, the instability in the

administration may delay the realisation of Society 5.0. Furthermore, it is noteworthy to mention that a vision created by a government could be inclined to be too ambitious and too utopian in order to show off and elevate international status. Nevertheless, even if the administration changes, the basic direction towards the future of society will be retained if the large-corporations, academia, and media, who are responsible for promoting the vision, continue to pursue the realization of Society 5.0.

Third, as most of the research participants had a technological background, it is possible that technological perspectives were overemphasized in the answers. In fact, the data collection result has shown that many of the answers were covered with technological perspectives. In addition, as mentioned in sub-chapter 4.2, the gender of participants may have affected the outcome. Since I focused on looking for the potential interview participants based on whether they have any experience in Society 5.0 during the recruiting process, gender was not an important element to consider in this research. As a result, only one out of 8 participants were female. This may have affected the results of the data collection to some extent. As Burgess (2021, 143) stated, on average 80 per cent of AI researchers account for males according to the 2018 AI Index. Therefore, it is likely that a large proportion of those who have some experience or touchpoint with Society 5.0 is male since technology plays a big part in Society 5.0. In fact, the majority of people I contacted were male. While I contacted several female potential interview participants, it ended up that only one female person contributed to this research. Hence, this research can be biased in some way, especially from technological aspects. On the other hand, technology is one of the fundamental elements for Society 5.0. Thus, it is reasonable that technological perspectives cover a large part of the data collection result as it is unlikely to realise Society 5.0 without the use of advanced technologies.

Lastly, there is also a limitation regarding the number of participants. Six out of eight participants participated in the interviews. On the other hand, the rest of the participants answered the questions in a written format. If more interview participants would have participated, there is the possibility that different perspectives would have evenly emerged as answers as the result focuses mainly on technological perspectives. Yet, considering the following three facts, it can be concluded that the research data is unique and rich in diversity. First, Society 5.0 is a relatively new concept and not well-known yet both domestically and internationally. Second, I actively collected the research data by contacting only potential participants who have the expertise and experiences with projects related to Society 5.0. Third, the research data was collected both in

Japanese and English depending on the nationality. This allowed for gaining diverse insights and expanded the possibility of reaching people who would have been otherwise difficult to reach by using only either of the languages.

6.2 Conclusion

In this final chapter of the thesis, the key findings and the research outcomes throughout the whole research will be summarized. The objective of this thesis was to answer to the main research questions supported by two sub-questions. To respond to the research objective, this thesis performed broad and exploratory research of literature before starting empirical research. After gaining a better understanding of the concept of Society 5.0, qualitative interviews were executed with participants who have an in-depth understanding of the concept of Society 5.0 and have experience of being involved in projects closely related to Society 5.0.

1. What is Society 5.0 and how does it differ from Industry 4.0?
2. What are the key factors shaping the human-centred society illustrated in Society 5.0?

The first question can be answered through both literature review and key findings from interviews. In order to answer this question, the research explored the background of Society 5.0 and Industry 4.0 extensively. To answer the first part of the question: Society 5.0 is Japan's government-wide national vision, which aims at solving multiple social issues and enhancing human well-being. The use of cutting-edge technologies is the cornerstone of the vision, and the ultimate aim of Society 5.0 is to merge cyberspace into a physical space at a high degree so that the cyber-physical system can produce meaningful information to help solve various social issues. The answer to the last part of the first sub-question is that unlike Industry 4.0 where cutting-edge technologies such as AI, IoT, robotics and Big Data analytics are applied mainly to a manufacturing sector, in Society 5.0 they are applied to society as a whole. Each objective is also different. While Industry 4.0 seeks to enhance productivity and profitability, Society 5.0 aims at transforming society with a focus on human wellbeing.

The second research question was answered by analysing the empirical data and literature review. It has also attempted to apply the PESTEL analysis and the idea of backcasting approach by focusing on describing how human-centred society visualized

in the vision of Society 5.0 can be realised. In order to describe that, potential key factors shaping the development of Society 5.0 were identified and analysed based on the empirical material. First, it seems that creating technological frameworks based on reliability, transparency and openness which are shaping the realisation of Society 5.0 is the essential element to steer the society in the right direction. This is a step forward to gain social trust and acceptance of such emerging technologies by developing them that can be a benefit to all. Second, multi-stakeholder collaboration is key in the creation of such frameworks. The role of technology and digitalisation is critical in the realisation of Society 5.0, and it is the people who are most impacted by the development of technology and digitalisation. Hence, it is desirable that they are developed and designed by multi-stakeholders in a way that can benefit society and individuals the most, rather than passively following their development them. Society 5.0 is not the extension of today's information society, and it needs to be realised through co-creation by multi-stakeholders. Third, in order to demonstrate that the realisation of Society 5.0 is a feasible vision, addressing some examples is a vital element. Social innovation, which is empowered by citizens and the use of the combination of ICT and emerging technologies, was identified as one of the potential examples to be demonstrated for the step towards realising Society 5.0.

It seems that Society 5.0 is still a too theoretical and broad concept at present. Thus, it became clear throughout this research that a concrete roadmap that can guide multi-stakeholders is needed. Nevertheless, Society 5.0 is one of the prime examples of a future-oriented vision that is ambitious yet significant to navigate the societal evolution in a positive way and lead to help solving multiple societal issues. The social issues, such as an ageing society accompanied by a shrinking workforce and natural disasters, which Japan is currently facing, will eventually become significant even in countries where those social issues are marginal. Hence, solutions and approaches addressed in Society 5.0 could be shared with other countries as well.

From the futures research perspectives, as Glenn (1994, 5) describes that futures research should be assessed by how well a researcher can help decision makers create policy now, this thesis has attempted to enable readers, policymakers and leaders to better understand what to do and why based on the identified key factors. Presenting potential key factors towards Society 5.0 provides the opportunity to indicate potential pathways, co-create the future, and think about what kind of future we might want. By approaching the topic of Society 5.0 from future oriented perspectives and conducting a

series of interviews with experts who have diverse background, this research generated a unique research data which includes different approaches from the existing published literature. This thesis attempted to highlight the direction of the future of the society we can aim at and contribute to open up the discussion for further research into a more detailed implementation strategy to realise Society 5.0.

6.3 Suggestions for future research

Since this research focused on identifying key factors shaping the development of Society 5.0, this research could be continued by building a concrete roadmap within the field of futures studies. In order to fully commit to the realisation of Society 5.0, analysing and building step by step developmental pathways towards Society 5.0 could be one of the key approaches. The further research could be executed by using the similar futures methodologies than were utilized in this research. The PESTEL table used in this research could be developed further by exploring and adding other aspects. In addition, not just the idea of backcasting, the backcasting technique could be fully applied by developing concrete steps in order to attain the common desirable future illustrated in Society 5.0. In this case, since the scope of Society 5.0 is extensive, the research scope could be narrowed down to a specific industry or field. Nevertheless, regardless of the scope of the research, as a starting point for the future research, the identified key factors in this research may contribute as a basis.

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APPENDICE

Appendix. Interview Questions

- What do you think are the similarities and differences between Society 5.0 and Industry 4.0?
- What do you think are the factors which led to the creation of vision Society 5.0?
- What do you think are the driving forces to facilitate and achieve Society 5.0?
- Whose responsibility do you think it is to drive and implement Society 5.0?
- Do you think Society 5.0 is applicable only in Japan or is it applicable in other countries as well?