Chapter 8
Issues and Outlook

Atsushi Deguchi and Kaori Karasawa

Abstract As a final part, this chapter discusses the goals and the issues in the process of realizing Society 5.0 from the view of happiness of human being in harmonizing with the society, and concludes by overviewing the significance of Society 5.0 and its outlook as a policy for the data-driven society promoted by digital revolution.

Section 8.1 mentions the issues in the happiness to be provided with human being through data-driven society, and points out that it is needed to clarify the approach through which each person will be able to obtain his/her own happiness by approving the data-driven technology implementation and harmonizing with the data-driven society. In addition, it mentions the issues in the coexistence of the free choice by persons and the social control, and suggests that we should apprehend the moral questions to be considered in the process of realization of the data-driven society.

Section 8.2 summarizes the social meanings and significance of Society 5.0 as a vision originating in Japan to be aimed with the implementation of advanced digital technology beyond the conventional smart city ideas. Consequently, it concludes by emphasizing on the importance of sharing the concept of "people-centric" in order to realize both the social problem solution and the economic growth as mentioned in the original definition of Society 5.0 in the Comprehensive Strategy on Science, Technology and Innovation for 2017.

Keywords Citizen-based innovation · Happiness · Regional revitalization · Technology-led social vision · Well-being

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8.1 Question of Happiness: Harmonizing Individual and Societal Interests

Humans and Happiness in Society 5.0

A supersmart society is where cyberspace is merged with the physical space (real world). That is what Society 5.0 is supposed to be. Underpinned by AI and Big Data, society will transform radically. The society to aim for is one that addresses the deep-seated hindrances to sustainability so that the people can lead a fulfilling and happy life. One of the keys to achieving this vision is to find how to create the right environment for society's inhabitants. This task requires planners to discuss the direction of new urban environments, consider how to design the society, collaborate with academics from different fields of study, and integrate cutting-edge technology and analytical approaches that are related to manufacturing and community development. Once the planners start creating an environment that supports a better life and establishing the institutional groundwork for building a sustainable society, they will have made an important step toward Society 5.0.

Where does the human individual fit into all this?

The literature on Society 5.0 is replete with references to humanity, people, and individuals. For example, there are frequent expressions such as "enhanced humanity," "respect for human dignity," a "human-centered society," "people-friendly," "greater freedom for the individual," and a society customized to "diverse human preferences." This language suggests that individuals' happiness is pivotal in designing environments and institutions, and that Society 5.0 must be designed in such a way to attain this objective.

Free and effective use of information, coupled with innovation in environmental and institutional designs, will emancipate individuals from the restrictions that hinder them from living a better life. Once freed from these restrictions, individuals can fulfill their desires and needs without undermining the sustainable development of society as a whole. Such a society is a happy society, for the individuals therein gain the mental health that comes with a satisfying and meaningful everyday existence, in addition to physical health. Such is the people-centric vision that Society 5.0 advocates.

The Challenge of Reconciling Individual and Societal Interests

So we share and commit to this marvelous future vision, but what must be done to make it a reality?

When we take a dispassionate view of the situation, we will see a host of challenges that today's society must overcome, including the depletion of energy resources, environmental degradation, elderly care needs, and shrinking workforce. These problems would not naturally disappear just because society elevates from 4.0 to 5.0. They will only get worse unless we find effective solutions. It is more

urgent than ever to construct a society that sustainably reconciles the outcomes of individuals' behavior with the common good.

However, it is no easy task to keep in mind the common good and strike the right balance between empowering and controlling individuals' choices. Humans are autonomous agents who exercise free choice, and these free choices cannot and should not be curtailed lightly. Yet this problem is exactly why we need a serious discussion on how to reconcile individual and societal interests. Such a discussion will be a critical step in defining what happiness means in Society 5.0.

Defining Happiness

We return to the question of what happiness is, a question that has occupied the minds of thinkers the world over since time immemorial. In designing a society, we must work out the conditions underlying happiness or well-being. What do we need to be happy? Let us examine the outcomes of the discussion process organized as part of a national project, as these outcomes constitute, to a certain extent, consolidated findings on the matter.

In 2010, the Cabinet Office gathered social psychologists, economists, and other experts and launched the Commission on Measuring Well-being. The commission reviewed the literature from Japan and overseas and selected certain metrics for measuring well-being. It then released its report in December 2011. The report is available online (Cabinet Office 2011).

According to the report (those interested in the finer details can read the full report), although it may vary with factors such as age, there are three common requisites for subjective well-being, each of which is predicated on communal sustainability. The first is socioeconomic condition, which includes wealth, income, work, housing, education, security, and safety. The second is health, which includes physical and mental health. The third is relatedness, which includes bonds with family, bonds with community, and lifestyle.

A Happier Society

These three requisites will likely remain the same whatever the times are. Given this, if advances in AI and digital transformation lead to urban environments, which are more resident- and worker-friendly, or if advances in healthcare allow us to live healthier lives, society as a whole will be much happier. In other words, if, as we move toward Society 5.0, we manage to improve socioeconomic conditions and promote better physical and mental health, we can achieve a happier society at least in these two aspects.

But this change will entail the dilemma I mentioned earlier: how to reconcile individual and societal interests. Even if technology streamlines our systems and

makes us richer, we will still face the same challenge of having to distribute limited resources. Although it might become easier for individuals to seek comfort and fulfill their specific needs, such a society will not be sustainable if it gives individuals free reign to rampantly pursue consumption, unfairly monopolize resources in pursuit of their own happiness, or otherwise exploit its systems. Aside from individuals' pursuit of happiness, there must be a moral code directed toward the common good, and individuals must act in accordance with it. Technology and data alone are not enough to ensure that Society 5.0 is a happy society. Social design must emphasize the task of harmonizing freedom of behavior with behavioral regulation.

Behavioral regulation must accord with human nature; otherwise, there will be no true harmony between individual and society. Respect for human dignity would be undermined if society restrains individual freedom, or if individuals defraud society. A happier society is achievable when individuals, in their pursuit of happiness, exercise freedom of choice according to their own values, and when these individuals' behaviors are tempered by a moral code that enjoins sustainability.

Social Design and Relatedness

Social design must also consider the third condition of well-being, relatedness. Relatedness is significantly shaped by things like housing, workplace, digital environments, human services, and AI substitution.

But, how, in the first place, will the supersmart society, one formed by "merging the cyberspace with the physical space (real world)," change human relationships and what new communities will it create? Will we become more homogenous in terms of class and values, or will we become more diverse? We might use the extra free time to socialize with those who are close to us, but in doing so, we might grow more distant from those less dear to us. Will we spend more time engaging in flesh-and-blood social interactions, or will we interact more with AI friends? In asking these questions, one realizes how little we currently know about how Society 5.0 would influence relatedness.

The opaqueness of this issue makes the task of social design all the more important: the task of framing Society 5.0 as a society with a relatedness conducive to well-being. But once again, the harmony between individual and society will be jeopardized if all priority is placed upon allowing individuals to pursue, in the here and now, the kinds of relatedness that they believe will yield comfort. Suppose, for example, that everyone interacts only with people who share their values and avoids everyone else. Such a scenario may be mentally comfortable. However, it would also create exclusive cliques, giving rise to inequality and discrimination. It would also deter tolerance and the creativity that arises from diversity. Consequently, human life may become poorer.

An important thing to remember is that social design often affects relatedness in unintended ways; there are side effects. Planners might design a smart city to be convenient, safe, and comfortable, and then present it to people, but would people

move to this city randomly? Or would the planners ultimately, if unwittingly, select for certain groups, such as members of certain socioeconomic statuses or holders of certain values?

Unintended consequences are difficult to predict. They are especially difficult to predict when it comes to human relations, owing to the myriad of social phenomena interweaving such relations. All the more reason, then, to be extra mindful of how society is the aggregation of individual relations and of how happiness in Society 5.0 must be grounded in the harmonization of the two.

Free Choice and Social Regulation

For Society 5.0 to be a richer, more comfortable society, we might start seeing the pursuit of greater comfort and wealth as something that is perfectly normal. When people have greater freedom to choose the things they like, perhaps they will make more selfish choices. Thus, in order to reconcile individual and societal interests in a way that achieves greater happiness, we must at some point regulate individuals' behavior.

A society that proclaims a high level of happiness (in terms of comfort, convenience, wealth, and health) for the many is a society that unleashes people's desires, such that people have a much higher level of demand or a stronger desire to freely act to get the things they value. However, when people are freer to pursue the things they want, they will sometimes harm the common good, so it is necessary to control individuals' behavior to some extent. In the second half of this section, I explore how society can regulate the behavior in a way that accords with human nature.

The Pitfall of Rewards and Punishments

One rather crude way of controlling behavior is to offer rewards and punishments. Undeniably, rewarding certain behavioral outcomes with money or nonmonetary compensation can powerfully shape behavior. Even if some claim that they do not work for money, which is one side of truth about human kind, money is a central fact of human life. No society could exist without a system of rewards and punishments, and we live our lives within such a system.

Both rewards and punishment entail certain social costs. These are the costs associated with delivering the rewards and punishments and that of monitoring whether they are being delivered appropriately. These costs could be reduced by incorporating technology into institutional environment. In this way, Society 5.0 could condition human behavior with a system of rewards and punishments that is more efficient than its previous iterations.

But herein lies a pitfall. Relying on a system of rewards and punishments may undermine the goal of a people-centric society. That is, it may run counter to respect for behavioral autonomy and the will to seek freedom—the idea that people should

act in a way that is true to their inclinations and values. Once people start believing that their behavior is being conditioned by a reward or punishment, they may lose their intrinsic motivation and start exhibiting reactance (more on this later).

Intrinsic Motivation

There are two main types of motivation behind human behavior: intrinsic and extrinsic motivation. Intrinsic motivation is the desire to act based upon one's interests, inclinations, or values. Extrinsic motivation is motivation that comes from outside the person, such as from rewards, punishments, or coercion.

Too much extrinsic motivation can kill off intrinsic motivation. For example, suppose that a group of people desire to save energy. If these people live under a system that rewards energy-saving efforts, they will naturally make an effort to save energy. However, once they start attributing their efforts to the reward society offers them, they will cease to believe that they are making energy-saving efforts because they intrinsically want to make such efforts. Consequently, their intrinsic desire to save energy is undermined. Likewise, when you start believing that you are working for the pay, you will in many cases lose interest in the work itself.

Humans always seek a reason for why they are doing something, and when a reason becomes prominently apparent, other possible reasons get pushed to the wayside. Thus, once individuals start seeing extrinsic inducements, such as rewards and punishments, as the basis for their behavior, they will get the notion that they are not acting this way as a result of their inclinations or values.

Reactance

We believe that we have a freedom to choose our own action. As such, we react defiantly when it seems that someone is taking away our behavioral choices or forcing us to choose a certain action.

This is called reactance. One problem with reactance is that the inability to exercise a certain option can make that option appear more attractive than it should be. Something that a person would have chosen, had they been able to act freely, will start to appear all the more attractive as a result of the person having been potentially able to obtain it. Another issue is that reactance creates a mounting desire to restore one's subjective freedom of choice. A person may naturally incline toward certain desirable behavior, but if you attempt to induce that person to perform this behavior, they might make an alternative choice despite their original preference for the desired behavior. To relate this phenomenon to the example of energy saving, when people believe that they are being induced into saving energy by a system of rewards and punishments, they will start seeing wasteful energy use as all the more attractive, and may deliberately waste energy when no one is watching.

Design That Fosters Desirable Inclinations and Values

Intrinsic motivation and reactance may unleash the inner devil. But they are essentially linked to that most essential part of humanity: our autonomy and freedom of choice. They are key to honoring the dignity of humans as autonomous agents who act according to their perception, beliefs, and values. To be people-centric, society must have its environment and institutions designed upon the premise of human autonomy.

Therefore, planners must always be circumspect about the extent to which they rely on rewards and punishments. To ensure the sustainability of the system, the utmost care must be paid to the question of how much you circumscribe human behavior. If looser regulation is possible, rewards and punishments should not be introduced rampantly. Instead, there should be a more gradual system of inducements (nudges are an example of this) to promote behavior that leads to a harmonization of individual and societal interests. This strategy will help ensure that people behave in a way that is true and natural to themselves.

This strategy is advantageous because it fosters the inclinations and values that align with the desired behavior. I claimed earlier that if people believe that their behavior is motivated by a reward, they will be unlikely to believe that they are motivated by their own inclinations or values. However, the reverse is also true; when people do something without any rewards, they will attribute the cause of their behavior to their inclinations and values.

Thus, if society has subtle inducements (as opposed to rewards and punishments) under which individuals choose to act in the desired way, these individuals will recognize that their inclinations and values naturally align with the desired action. This strategy may therefore succeed in conditioning individuals' behavior without undermining the human desire for autonomy and free choice. At the same time, in empowering people to act in accordance with their inclinations and values, the strategy may also help ensure that individuals' behavior aligns with the interests of society as a whole.

Of course, this may not be so easy to accomplish in practice. If we could quickly and easily foster the inclination and values underlying the desired behavior, we could solve many of the social problems before they become too serious. We know from common sense as well as from research into human behavior that people will frequently act contrary to how you want them to. Therefore, I neither propose a simple recipe for behavioral regulation nor am I saying that rewards and punishments should never be used.

The key point is this. All societies need to control individuals' behavior in some way, and Society 5.0 likewise must do so, deploying all available wisdom to this end. But Society 5.0 must do so in a manner that accords with human nature—not just to prevent unexpected misfires, but to forge the way to a happier society, where there is harmony between individual and group interests. Planners must adopt such a perspective when designing the environment and institutions, as the principle of honoring human dignity requires no less.

Finally, Some Outstanding Moral Questions to Consider

We have discussed how we can achieve happiness and well-being in Society 5.0, and how to this end we must harmonize individual and societal interests in a manner that accords with human nature. Finally, I want to raise some moral questions. What underlying norms and principles should a society refer to when deciding how to guide its members' behavior? What kinds of behavior should we allow society to regulate? Who has the right to subtly induce behavior in others?

The world is already awash with inducements, including online ads. Against this backdrop, it may be desirable for benevolent planners to induce behavior, taking into account the common good as well as commonplace value judgments. However, some may intuitively feel aversion or dread toward a society that uses a system of ploys to make people behave in a certain way without them even suspecting that they are being conditioned.

There are no clear answers to the above issues. The absence of answers should not be an excuse to ignore the questions or to shelve all the work we must do to harmonize the interests of individuals and society. Although the answers may elude us, we must keep seeking them out.

We must do so because we have a duty to the future generation who will live in Society 5.0. Those who introduce new technology or design institutional arrangements and those who debate the shape of Society 5.0 must consider, from various perspectives, which of the available options would be more judicious or appropriate, if not absolutely ideal. Such an approach will help ensure that the future society honors its members and delivers to them happiness and well-being.

8.2 Significance of Society 5.0 and Its Outlook

Up to now, we have discussed the concept and nomenclature of Society 5.0. We have also discussed the basic approach to making Society 5.0 a reality, the basic approach to technological development, and how we might achieve a people-centric society. In this section, I outline the social significance of Society 5.0 as well as the outlook and challenges.

Vision for a Society Driven by Technology

As outlined in the Science and Technology Basic Plan, Society 5.0 simply presents a vision of a society driven by science and technology. A supersmart society where cyberspace is merged with the physical space (real world) is underpinned by technology for gathering and collating data within a cyberspace architecture, and by technology for converting the data into knowledge and reintegrating it into the physical

space (real world). This book has focused on such a technology and introduced information integration architecture (Chap. 4) and approaches for transforming urban habitats (Chap. 5).

This technology targets data collected from the physical space (real world). With this technology, all kinds of data, including that related to energy, transport, shopping history, emissions, and other facets of urban environments, get stored in cyberspace. In its raw state, the data is just a series of digits. However, the technology processes the data into meaningful information and then into knowledge. This knowledge then actively influences the physical space (real world). In this respect, the supersmart society, one formed by "merging the cyberspace with the physical space (real world)," is essentially a more advanced form of the knowledge-intensive society and data-driven society.

The difference is that the future society in which the technology will be used is a people-centric society. Solutions to tackle social challenges (such as the super-aging society and the carbon-free society) may end up forcing people to make sacrifices. The technology in Society 5.0 is that which balances such solutions with the principle of a people-friendly society. Though the society is driven by science and technology, it remains people-centric. The researchers and engineers working in R&D must bear this point in mind: Society 5.0 is a vision of a science and technology-driven society, but the goal of this vision is a people-centric society.

Principle of People-Centric Society and How We Get There

What is a people-centric society? To recap, in the Government's Comprehensive Strategy on Science, Technology, and Innovation (STI) for 2017, Society 5.0 is described as a society that, "through the high degree of merging between cyberspace and physical space, will be able to balance economic advancement with the resolution of social problems by providing goods and services that granularly address manifold latent needs regardless of locale, age, sex, or language to ensure that all citizens can lead high-quality, lives full of comfort and vitality." This definition tells us two things.

First, it tells us that Society 5.0 is a sustainable society, one that balances the resolution of social problems (the interests of society as a whole) with people's need for security and comfort (interests of individuals). As the pressure mounts to deal with climate change, Japan now faces the urgent task of going even beyond the low-carbon society, to the zero-carbon society. As a developed nation with an aging population, Japan also faces an urgent task of coping with the super-aging society. Tackling these challenges without hindering people from living in security and comfort in the process is, for Japan, key to becoming a model of how to overcome the problems associated with a developed economy.

Chapter 2 discussed "Habitat Innovation," a framework for approaching this task. This framework helps steer policymakers away from solutions that force people to make sacrifices. It does so by breaking down the indices for solving social

problems into three broad components (policymaking, technological innovation, and pursuit of QoL) and various metrics so as to highlight the optimum balance between what is best for society and what is best for the individual. The chapter then underscored the importance of industry–academia–government collaboration in each of the three components. Research on improving QoL has a particularly crucial role to play in promoting the people-centric society, and the humanities and social sciences can offer vital insights to shape our vision of society and humanity, an essential task in making Society 5.0 a reality.

The second thing this definition tells us is that Society 5.0 is an inclusive society, one that accommodates diversity and a multiplicity of preferences. Previous approaches have tended to emphasize economy and efficiency at the expense of capitalizing on the unique features of communities. When people live in homogenized residential environments where choices are limited, they may end up conforming to a cookie-cutter lifestyle. Amid diversifying preferences, Society 5.0 points to a society in which people have more freedom of choice in their residential environments and lifestyles, and are better able to enjoy their hobbies and leisure time. It is a society in which people access services that suit their specific preferences without segregating themselves from people of different preferences or of a different income level. Already we are using cash less and less, and we are shifting increasingly to nonmonetary and sharing economy, in which ownership of tangibles has less value. As society changes, individuals must too. As Chap. 6 argued, this society-level transformation challenges us to reevaluate our values and revisit the question of what makes us happy.

IT is driving change in systems related to the economy, education, and welfare, so another challenge is to devise new kinds of social structures. We must also have a deeper discussion on what makes individuals happy and how individuals and society should interface. The humanities and the social sciences have an important role to play in making Society 5.0 a reality, and once the discussion of these issues becomes open to the public, the Society 5.0 concept will start to permeate in the hearts and minds of the people.

Citizen-Based Innovation

Chapter 3 discussed the existing smart city concept, citing past cases where technologies such as smart grids have been applied in the energy sector. Traditional smart city models involve the practical application of techniques and technologies that use data in a particular sector (such as energy or transport). The supersmart society goes a step further than the smart city; it is not just "smart" but "*super*smart," in that it transcends sectors and strongly emphasizes inter-sector collaboration. One of the greatest technical challenges to this end is to construct a technological development framework under which we can put into operation an information integration architecture and a data platform, which will enable data and information to be integrated between different sectors and will provide a knowledge database linking

together the information in different sectors. Thus, the Society 5.0 concept can help spur the technological development necessary for such cross-sector collaboration.

Another task to tackle is to overhaul the traditional model of industry–academia partnership. It will remain important for academic research institutes to steadily advance research projects under commission from or jointly with private companies. But such projects are limited in their capacity to yield systems that can lead society. There are already numerous examples in Western countries of companies and universities collaborating in projects on a common organizational footing. In pursuing Society 5.0, companies and universities should adopt the industry–academia collaboration model, in which they draw on each other's strengths to research a future social vision alongside technological innovation and communicate their findings to a global audience.

On the other hand, Society 5.0 has created an opportunity to develop related technologies such as Big Data analysis and information integration architecture. It has certainly given businesses, universities, and government added impetus to collaboratively develop related technologies, but the opportunities should not be limited to academics in STEM fields, manufacturing businesses, and app developers. The technology underlying Society 5.0 should be broadly defined. Chapter 3 introduced the case of Barcelona, which installed numerous sensors in streets and released the sensory data to the public so that citizens can monitor the data themselves. This approach helped the city address its problems. As this case suggests, a key task in developing the cyber architecture for Society 5.0 is to use IT and Big Data analysis as a means to practically apply ideas for improving citizens' daily lives and living environments.

There remain many facets of our daily lives that are not yet digitized and presented as data. Innovative ideas for digitizing these things and then making use of the data will spark the development of sensor technology and apps for visualizing the data. Given that part of technological development is to unearth the social needs that underlie the technology, we can assume that anyone with a good idea will participate in the process of building Society 5.0's cyber architecture. Moreover, new social systems, such as the sharing economy, have matched individuals' ideas with IT, fleshed out these ideas, and proliferated them in a grassroots manner. Habitat Innovation must be driven by the spontaneous ideas of citizens, who know their habitats well. Likewise, it is citizens who are the end users of the technologies for merging cyberspace and physical space (real world). In these respects, Society 5.0 is a society that facilitates innovation by citizens and for citizens, and that is itself the product of the aggregate of such innovation.

Development of Human Resources and Education

Another prerequisite for Society 5.0 is to ensure that the education system produces experts in the fields where new demand will arise (see Fig. 8.1). When it comes to education, there are two tasks to emphasize.

The first task is to train up experts who use AI to analyze Big Data, as the societal demand for such will grow ever greater in the years ahead. The growing demand for data scientists is attracting attention among genomic Big Data analysts in the fields of medicine and pharmaceutics. With a growing array of IoT-related products, there is now an urgent task to train up experts who can use AI to analyze the Big Data that these products collect. Demand for data scientists is set to soar in fields such as transport (self-driving vehicles), energy (CEMS/BEMS), construction (i-construction), and commerce (e-commerce). Already, universities are struggling to keep up with the societal demand for such human resources. The current crops of university students are not enough to plug the shortfall, so part of the answer lies in recurrent education.

The second task concerns the importance of information literacy in the data-driven society. The general public must gain the literacy to accurately decipher data and information. When you misread data and information, you will tackle a problem in the wrong way, and you might end up using the data or information incorrectly. Suppose, for example, that a local region is experiencing rising crime. The way the local government tackles this problem will depend on how it interprets the crime data. Criminal activity is concentrated in certain hot spots. The local government will use data to tackle the crime problem in either case, but the countermeasures it takes will depend on whether it focuses on the crime hot spots or on the people committing the crimes. It must also consider how releasing this data might impact local communities. Crime data is a classic example of how difficult it can be to interpret data and respond appropriately. Particular care must be taken with open data, as the way the public reacts to the data will impact the local community's future in various ways.

For these reasons, information literacy (how to interpret and use data and information) will become even more crucial in the data-driven society. Educational institutions from elementary school to university will shoulder this task along with

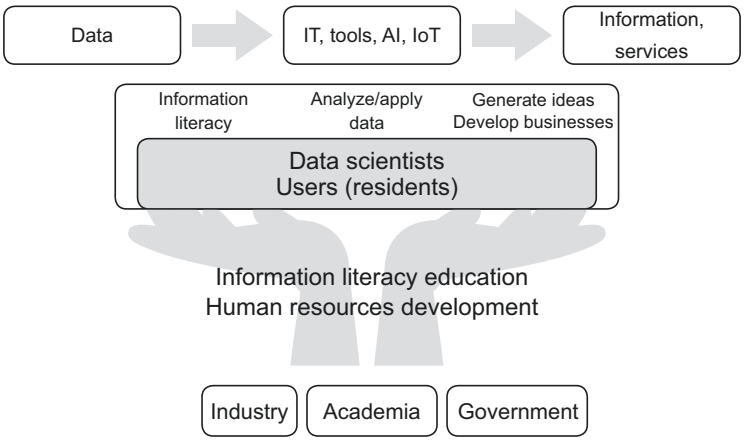

Fig. 8.1 The importance of human resource development and education

companies and local communities, but education in particular will have an essential role to play in helping members of the public gain information literacy. When the public is information literate, the region will become a pioneering example of a true data-driven society, one in which data is used to promote secure and convenient lives in the local community. Educational institutions, businesses, and government each have their role to play in training up the human resources necessary for Society 5.0 and ensuring information literacy.

Promoting Regional Revitalization

The success of Society 5.0 depends on whether national and local governments can assert the political leadership necessary for a strategic shift and institutional reform. There are many different institutional issues that hinder progress in essential tasks such as building an inter-sector information integration architecture and striking a balance between the protection and access to personal information. Moreover, there will be a greater need than ever to ease regulations so as to enable innovation and creation of new business opportunities.

Another issue is that the data of local communities is managed privately and publicly in a decentralized manner, so efforts must be made to consolidate and coordinate the management of such data. To build the inter-sector information integration architecture, government must take a sledgehammer to its vertically compartmentalized systems of data management (see Fig. 8.2). A single set of geographical information is managed and used among assortment of government departments related to construction, roadworks, and sewage systems, so the management of the data must be coordinated. Likewise, data related to transport, welfare, and education must be integrated in such a way that it can be used in other departments. Another matter that cannot be sidestepped is that of personal information protection. Personal data banks and information banks, which hold and use personal information, have burst onto the scene, and they have great potential in the years ahead. Data use is key to Society 5.0. Chapter 3 introduced examples of pioneering local government initiatives in the West and in Japan. These examples illustrate how local governments in rural or provincial areas can benefit when governmental data is opened up to the public, after ensuring human security.

National and local governments must recognize that existing policies will not be enough to balance the resolution of social issues with the demand for pleasant daily lives. They must then reassess the values and principles underlying these policies. Next, they must set new policies and use KPIs to measure their effects. To that end, they must continually collect and analyze data to ensure that policies are grounded in evidence. It should not just be private companies who make use of data. In fact, the Government's Council for Promoting Statistical Reform has advocated evidence-based policymaking (using statistical data as evidence to legitimize and measure the success of policies) (The Council for Promoting Statistical Reform 2017).

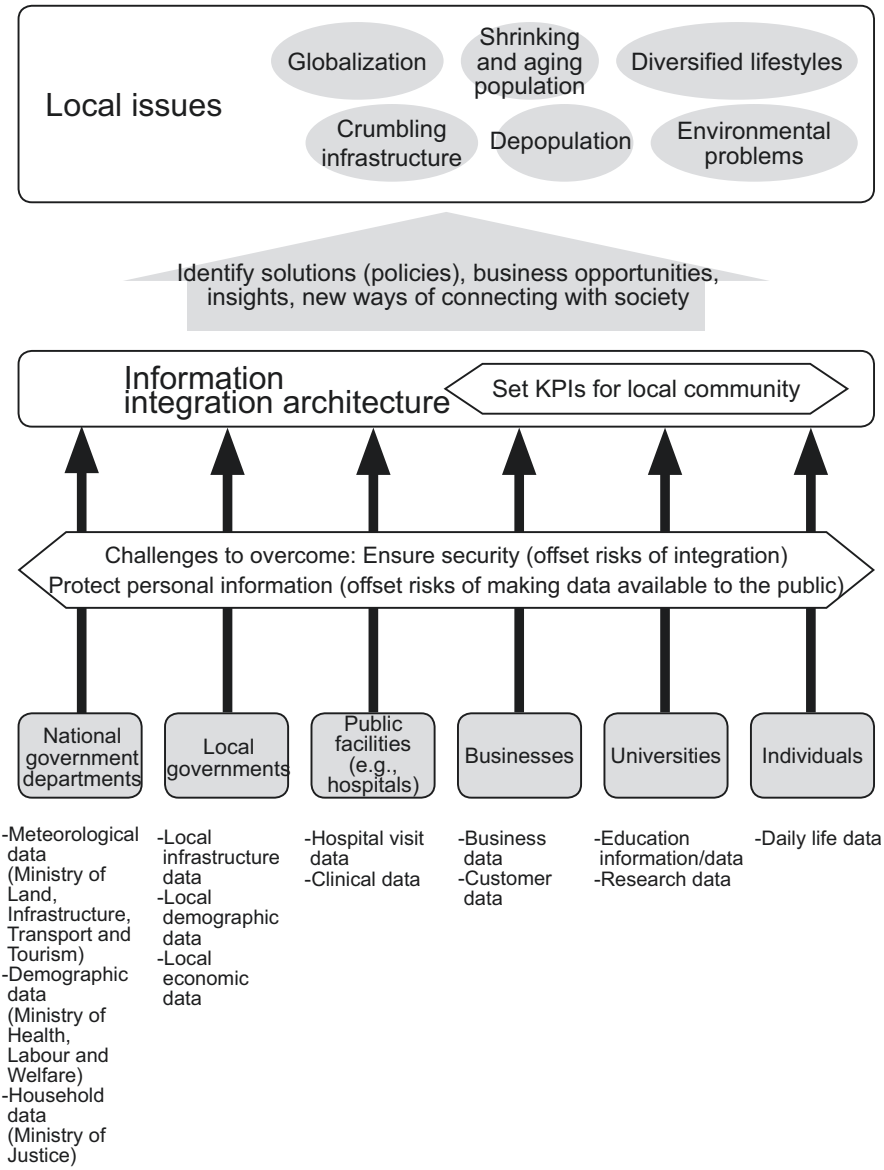

Fig. 8.2 Data integration for regional vitalization, and the relative issuess

In the interests of regional revitalization, there must be an industrial ecosystem. More specifically, local governments and local companies should partake in the vision of the Society 5.0 and promote an IT-based industrial ecosystem to revitalize their local communities. To this end, the national government and local regions

must share the common objective of building an ecosystem that can organically link the small businesses and startups that emerge as a result of open data.

To ensure that the Society 5.0 vision of a supersmart society gains traction in provincial regions, there must be regulatory easing in these regions, and government data must be made available there as open data. To ensure that such actions lead to improvements in public services, create business opportunities for new businesses, and encourage universities and companies to collaboratively develop new technologies, there must be an advanced infrastructure that integrates local information networks, and this infrastructure must be used. Local actors must also coordinate industry and academia in such a way as to promote the local area's unique produce and advanced manufacturing as well as a new local service industry.

Society 5.0 as Business Opportunity

Society 5.0 offers a boon to the private sector: the shift from data monopolies to open data will generate new business opportunities. Traditionally, companies have gained profits by monopolizing their customer and marketing data. From now on, companies will create new business opportunities by releasing their datasets as open data (after ensuring human security) and sharing them with others in cyberspace. While paying due attention to personal information protection, companies will publicly release data that they were unable to fully analyze themselves. Bus, railway, and taxi operators will release their people flow data; estate agents will release their data on land and property use; power and gas suppliers will release their data on energy consumption. When all these data are collated and combined, it will surely generate business synergies that the individual companies would otherwise have missed. There will be a great potential for forging new businesses that deliver better services to local communities and users (see Fig. 8.3).

However, there are several challenges to be overcome in proliferating and commercializing the smart city models and initiatives discussed in Chap. 3. For example, in existing smart city projects such as those based on energy management, the aim was to conduct a government-subsidized test bed project and then practically launch the initiative and roll it out in other cities. The challenge in such cases was to make the project commercially viable. The difference with Society 5.0, a society that provides "goods and services that granularly address manifold latent needs," is that the business opportunities extend to members of the public; those with the will to do so can seize these opportunities by using their ideas and insights to forge new IT-based businesses.

In the process of making Society 5.0 a reality, many new business opportunities will arise among universities. The more we progress toward a knowledge-intensive society, the greater opportunities academics have to forge new industries using the body of technology and knowledge accumulated in their research activities. Thus, Society 5.0 expands business opportunities among university students and researchers, and the public at large.

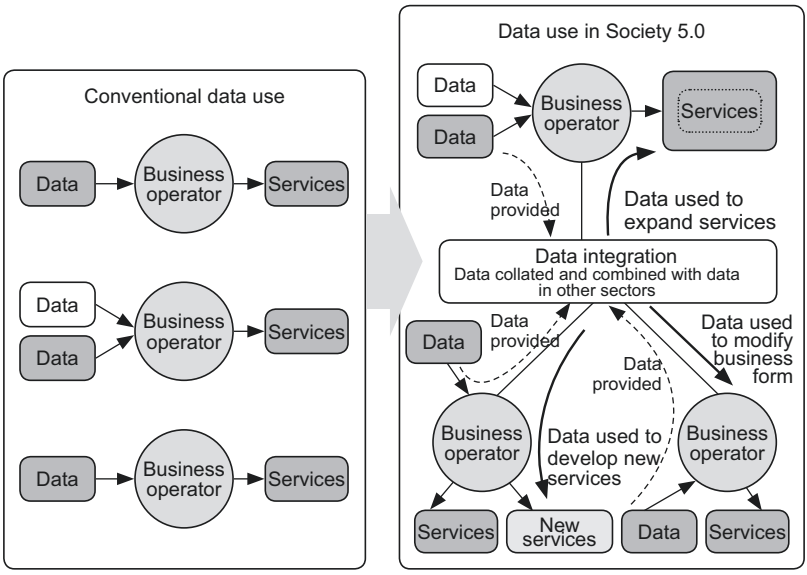

Fig. 8.3 The importance of data integration for creating new businesses

Movement Originating in Japan

Society 5.0 is, in some respects, Japan's global message to the next generation.

Other countries have made headway in applying models in the field of energy management. Broadly defined smart city initiatives are underway in many Western cities. Against this backdrop, Society 5.0 is Japan's homegrown concept for the next generation. There are two aspects to emphasize here. First, Society 5.0 is a vision of a technologically advanced society, one underpinned by Japan's technological prowess. Second, amid the concerns that capitalism will lead to further division, Society 5.0 offers the world a vision of society that is both technologically advanced and people-centric. Whereas Germany's Industrie 4.0 aimed for an IT- and IoT-driven revolution in manufacturing, Society 5.0 includes in its scope the goal of an inclusive society, one that accommodates social diversity and individuals' preferences. Much of the value of Society 5.0 therefore lies in the fact that it presents to the world a future vision that looks beyond technological sophistication, to a people-centric society.

However, if we are to export the idea of a supersmart society that merges cyberspace with physical space (real world), we must tackle a technical and institutional challenge: how to link the cyberspace and information integration architecture across national borders. For the idea of Society 5.0 to gain global traction, the data inside the cyberspace, as well as the cyberspace itself, must be globally standardized. We must work to develop standards regarding the data in sectors such as energy and transport, and standards regarding the process of integrating such data

between sectors. In other words, developing standards (such as ISO standards) for sectors related to Society 5.0 is a major ongoing task.

Generally speaking, data should be prepared according to international rules and standards to ensure that it is objective and broad, and that it allows for comparisons with data from other points in time or from other regions. Society 5.0 is critically important for Japan to shift from a problem-stricken to problem-solving developed nation. If Japan succeeds in implementing problem-solving models such as the "vibrant aging society" and the "zero-carbon society," the technology and systems it develops under such models can be exported to other countries and regions in the developing world (such as China and other developing states in Asia and Africa) that are set to face the same kinds of problems. In promoting Society 5.0 as a vision grounded in the country's technological prowess, Japan is providing a forerunner example of a vision-driven society fit for the twenty-first century. Whether this homegrown movement spreads globally will depend on the success of Japan's domestic initiatives.

A Recipe for SDGs

Ever since UN's Sustainable Development Goals, usually abbreviated as SDGs, were ratified in September 2015 at the United Nations Sustainable Development Summit, they have raised awareness of global challenges in Japan and other countries. There are 17 SDGs to guide sustainability policies in countries and regions around the world, and each runs from 2016 to 2030. Under the SDGs, there are 169 targets and 244 indicators (some of which are repeated for different SDGs). The SDGs are ultimately designed to fulfill the UN's pledge that "no one will be left behind." However, it is countries and regions that are responsible for working out how to accomplish the SDGs (United Nations Information Centre 2019; Ministry of Foreign Affairs 2019).

In Japan, companies, universities, and local governments explore ways of contributing to the SDGs, and the Society 5.0 project likewise should accord with the SDG framework.

Society 5.0 is a vision that advocates a technology-driven supersmart society and people-centric society; at the same time, it offers a roadmap for technological progress. Whereas the SDG framework outlines a bottom-up approach to achieving the UN's pledge that "no one will be left behind," the Society 5.0 approach is to facilitate the introduction of cutting-edge technology while also aiming for inclusivity. Insofar as it is a technology-driven vision, Society 5.0 is in large part an attempt to facilitate technological development in each sector. The SDG framework includes cutting-edge technology in its scope too, but it focuses more on solving global challenges such as regional divisions and inequality. As such, the focus of the SDGs naturally falls upon efforts to develop infrastructure (such as sewage works) and public facilities and solve institutional bottlenecks.

SDGs also serve to attract the attention of private companies (which tend to be very profit focused) toward the importance of social contribution and social value creation. They make companies realize that pursuing corporate growth alongside societal development will help the company itself achieve sustainable growth. In this way, they are effective in inducing companies to develop approaches and targets to such an end. The 17 SDGs cover a comprehensive set of themes, such that any company in any industry can find a way to contribute to at least one of them. This design means that the SDGs can easily be incorporated into the action plans of national and local governments and other core components of society such as companies and universities.

In the case of the SDGs, the main outputs are the degree to which the goals have been accomplished and how they are being tackled. In the case of Society 5.0, the aim is to use technology to balance economic advancement with the resolution of social problems, and in the course of this balancing process, technologies and the systems for pioneering and rolling out these technologies emerge. The outputs of Society 5.0, then, are the innovative technologies and systems as well as the resulting problem-solving models, which describe how problems were solved by introducing said technologies. These models can then serve as recipes on how to accomplish the SDGs. The outputs of Society 5.0—vision-driven technologies and systems—will emerge in society one after the other, providing ways to accelerate progress in the SDGs.

In summary, Society 5.0 has multifaceted significance. As concept of a technology-driven society that purports to be supersmart and people-centric, Society 5.0 does not just provide a vision to guide Japan's science and technology strategy; its relevance extends to the political and economic spheres, and it offers abundant hints on how to forge a future society.

The spread of IT applications is taking us steadily closer toward the supersmart society. But we still have no guarantee that the supersmart society would become a people-centric society as the fledgling vision suggests. We harbor the fear that future advances in IT and AI may, as has sometimes been the case, lead to a more inhumane society.

Thus, when it comes to Society 5.0, perhaps the most important thing is to keep in mind how technological innovation should lead society in a better direction, and to ensure that the principle of the people-centric society occupies the hearts and minds of the actors and organizations involved in technology development and community development, as well as the hearts and minds of the engineers and of each and every member of the public.

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