

## **Society 5.0**

**A human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space**

## **المجتمع 5.0**

**مجتمع يركز على الإنسان يوازن بين التقدم الاقتصادي وحل المشاكل الاجتماعية من خلال نظام يدمج بشكل كبير الفضاء السبراني والفضاء المادي**

**by**

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of the requirements for the degree of  
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## **Abstract**

We aim at creating a society where we can resolve various social challenges through digital transformation program; the government of Japan addresses the necessity of acquiring a digital transformation of the society. The framework of the Society 5.0 entails an approach which would be more human-centred. The key functions of the program include balancing the economic advancement of the nation with the resolution strategies addressing the social issues with the development of a system within which cyberspace and physical space would be integrated. This plan was fundamentally proposed in the 5<sup>th</sup> Science and Technology Basic plan addressing the necessity of building a future society which would be aspired by Japan. All of the basic components of the other four versions of society including the hunting society (1.0), the agricultural society (2.0), the industrial society (3.0), as well as, the information society (4.0) are incorporated within the concept of Society 5.0. This paper will give a prologue to the subjective period of figuring, in which psychological abilities from characteristic dialect and video understanding, machine learning, and choice help with clarifications and levels of certainty turn out to be extensively accessible as a major aspect of intellectual arrangements in the cloud, for example, cell phones. This summary will cover the basics of what everyone needs to know about building, understanding and working with intellectual frameworks in their own and professional lives - including the movement of subjective frameworks from apparatuses to partners to colleagues to mentors to coaches to mediators, trusted to perform some interactions on behalf of the user.

## ملخص

نهدف إلى إنشاء مجتمع يمكننا من خلاله حل العديد من التحديات الاجتماعية من خلال هذا البرنامج ؛ حكومة اليابان تعالج ضرورة الحصول على تحول رقمي للمجتمع. يستلزم إطار الجمعية (5) منهجاً أكثر تركيزاً على الإنسان. وتشمل الوظائف الرئيسية للبرنامج تحقيق التوازن بين التقدم الاقتصادي للأمة واستراتيجيات القرار التي تتناول القضايا الاجتماعية مع تطوير نظام يتم فيه دمج الفضاء السيبراني والفضاء المادي. تم اقتراح هذه الخطة بشكل أساسي في الخطة الأساسية للعلوم والتقنية الخامسة التي تتناول ضرورة بناء مجتمع مستقبلي تنطلع اليابان إليه. جميع المكونات الأساسية الأربعة الأخرى للمجتمع، بما في ذلك مجتمع الصيد (1.0) ، والمجتمع الزراعي (2.0) ، والمجتمع الصناعي (3.0) ، وكذلك مجتمع المعلومات (4.0) تم دمجها في مفهوم المجتمع 5.0.

ستعطي هذه الورقة مقدمة لمرحلة التفكير الشخصية ، حيث تتحول القدرات النفسية من اللهجة المميزة وفهم الفيديو ، والتعلم الآلي ، ومساعدة الاختيار مع التوضيحات ومستويات اليقين إلى إمكانية الوصول إليها على نطاق واسع كجانب رئيسي من الترتيبات الفكرية في السحابة ، على سبيل المثال ، الهواتف المحمولة. سيغطي هذا الملخص أساسيات ما يحتاج كل شخص إلى معرفته حول البناء والفهم والعمل مع الأطر الفكرية في حياته الخاصة والمهنية - بما في ذلك نقل الأطر الذاتية من الأجهزة إلى الشركاء إلى الزملاء والموجهين إلى المدربين إلى الوسطاء ، الذين يتقنون بأدائهم بعض التفاعلات نيابة عن المستخدم.

## **Dedication**

**To my dear parents, of you I was learned how to withstand, with no matter what the difficulties.**

اهداء

إلى والدي العزيزين ، تعلمت منكم كيفية الصمود ، مهما كانت الصعوبات

## **Acknowledgement**

Whatever we do and what we have roads opened for us and what we have reached about everything we dream of. We have to remember who were the reasons for our success, from our support and hold our hand to continue.

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## Table of Contents

Chapter 1: Introduction .....	1
1.1 Background of Society 5.0 .....	1
1.2 Problem Definition .....	2
1.3 The Solution .....	3
1.4 Research Aim .....	6
1.5 Methodology .....	7
1.6 New Value Contributed by Society 5.0 in Various Field.....	8
1.7 Operational process of Society 5.0.....	13
Chapter 2: Literature Review .....	19
2.1 Introduction .....	19
2.2 Cognitions as a Service (CaaS) .....	20
2.3 How artificial intelligence changes our lives .....	21
2.4 Devices and Services.....	22
2.5 Innovative Organizations and Micro Services toward API Economy .....	25
2.6 Design of Service System .....	25
2.7 Social Impact and its Concern.....	28
2.8 Smart Human of the Future.....	29
2.9 Fear for Autonomy .....	33
Chapter 3: Research Methodology.....	37
3.1 Introduction .....	37
3.2 Research Outline .....	37
3.3 Research online .....	37
3.4 Research Paradigm.....	39
3.4.1 Research Philosophy.....	39
3.4.2 Research Approach.....	39
3.4.3 Research design .....	40
3.5 Sampling Method .....	41
3.6 Research strategy.....	42
3.6.1 Justification for selection of research strategy (survey and interviews).....	42
3.7 Accessibility issues .....	44



3.8 Ethical Consideration .....	44
3.9 Data Analysis .....	44
3.10 Timetable.....	46
3.11 Summary .....	46
Chapter 4: Data Analysis and Discussion.....	47
4.1 Data Analysis .....	47
4.2 Discussion .....	60
Chapter 5: Conclusion.....	63
References.....	66

## List of Tables

Table 1: Time schedule for the research .....	46
Table 2: Responses on the practical application of Society 5.0.....	48
Table 3: Responses towards benefit of society 5.0 to the country .....	49
Table 4: Responses towards the main benefits of implementing society 5.0 .....	50
Table 5: Responses towards practical implication of Society 5.0 in the context of Mobility .....	51
Table 6: Responses towards practical implication of Society 5.0 in the context of Healthcare and Caregiving.....	53
Table 7: Responses towards practical implication of Society 5.0 in the context of agriculture ...	55
Table 8: Responses towards ways the implementation of Society 5.0 would benefit the disaster prevention and the energy saving capacities of Japan .....	56
Table 9: Responses towards components needed to achieve a Smart Services Society .....	57
Table 10: Responses towards main concerns associated with the implementation of Society 5.058	
Table 11: Responses towards ways Society 5.0 would function .....	60

## List of Figures

Figure 1: Research Onion .....	38
Figure 2: Responses on the practical application of Society 5.0 .....	48
Figure 3: Responses towards benefit of society 5.0 to the country .....	49
Figure 4: Responses towards the main benefits of implementing society 5.0 .....	51
Figure 5: Responses towards practical implication of Society 5.0 in the context of Mobility .....	52
Figure 6: Responses towards practical implication of Society 5.0 in the context of Healthcare and Caregiving.....	54
Figure 7: Responses towards practical implication of Society 5.0 in the context of agriculture..	55
Figure 8: Responses towards ways the implementation of Society 5.0 would benefit the disaster prevention and the energy saving capacities of Japan .....	56
Figure 9: Responses towards components needed to achieve a Smart Services Society.....	57
Figure 10: Responses towards main concerns associated with the implementation of Society 5.0 .....	59
Figure 11: Responses towards ways Society 5.0 would function .....	60

## **Chapter 1: Introduction**

### **1.1 Background of Society 5.0**

Located in East Asia, Japan is a developed economy with a high human development index. From having a highly skilled workforce to high standards of living, it is recognized globally (Granrath, 2017). There are specific challenges that are faced by Japan. Many interventions have been applied by the nation's government in terms of bringing advancements to the nation. Approaches like the Industry 4.0 address the necessity of obtaining a digital transformation of the manufacturing processes (i-scoop, 2018; Sugiyama et al., 2017). The society 5.0 is a similar approach which is oriented towards coping with the hurdles faced by Japan. The scope of this approach reach beyond the digitalisation of the economy. The digitalisation is rather oriented to impact all levels of the Japanese society. Through this program, the government of Japan addresses the necessity of acquiring a digital transformation of the society. The framework of the Society 5.0 entails an approach which would more human-centred. The key functions of the program include balancing the economic advancement of the nation with the resolution strategies addressing the social issues with the development of a system within which cyberspace and physical space would be integrated (Granrath, 2017; Shiroishi, Uchiyama and Suzuki, 2018). This plan was fundamentally proposed in the 5<sup>th</sup> Science and Technology Basic plan addressing the necessity of building a future society which would be aspired by Japan (Government of Japan, 2016; Cabinet, 2017). All of the basic components of the other four versions of society including the hunting society (1.0), the agricultural society (2.0), the industrial society (3.0), as well as, the information society (4.0) are incorporated within the concept of Society 5.0 (Granrath, 2017; Shiroishi et al., 2018).

The Japanese government is aimed to realise the meaning of the “Society” as well as the meaning of the “Super Smart Society” (Government of Japan, 2016). Thus an advanced service platform of the societal infrastructure is provided by the society 5.0. The platform applied by the common social infrastructure is based on prosperity. The continuous progress within the IT sector provides a tremendous opportunity to the society and also to the individual person of the society through different sectors in the form of innovation, prosperity and growth (CeBit, 2017). In the above context, it can be noted that the advancement policies can be achieved through the collaboration between human machines and the co-creation process (Harayama, 2017). The advancement process is also unprecedented within other sectors such as social, ethical, legal and in the safety challenges thereby indicating the need for identification of the advantages to take the basic benefit of those opportunities (Fujii, Guo and Kamoshida, 2018). The present research project discusses the service process of the society across different sectors such as IT, reality 2.0, cognitive service system and wisdom computing and its dependence on technology with focus on Society 5.0. It also presents a detailed discussion on the technologies that can help in the process of the providing a clear vision of the impacts that are associated with the society 5.0 and also with ‘ISSIP - *The International Society of Service Innovation Professional*’ (ISSIP, 2018). The path to ISSIP – a super-intelligent society comes from the role of technology in areas such as Internet stuff, Artificial Intelligence (AI), Internet physical systems ARC\VR, and data mining (analyses).

## **1.2 Problem Definition**

The world is in an era of radical change, with economic growth, life has become prosperous and comfortable, the demand of the energy as well as food is rapidly growing, average age increasing and society is progressing. With increasing globalisation, there is a rise in competition

internationally leading to adverse effects in the form of greenhouse gas emissions, increasing production and loss of food, verifying the costs associated with ageing in society and supporting sustainable industrialization. The crux of the problem within the development of an economy lies in the difficulty of sharing knowledge and information, the difficulty of cooperation, the limits of human, the burden of finding necessary information from big data and analysing it. The work and scope of work are constrained by varying degrees of capacity and age. There is also different restrictions as well as issues that are related with the big data are such as old age and due to the low local population, it became difficult in case of responding with adequate way. However, the development of an economy and the solutions that are provided is proved to be difficult given the current form of developments. Within the face of few basic changes in the new technological world that continues to grow through different aspect such as Information of Technology, Robotics, big data and AI, the progress of the society is effected. Society 5.0 seeks, like a new society, to integrate the developed technologies into different industries as well as in the various activities of the society to achieve economic development and provide solutions that are parallel with the problems of the society.

### **1.3 The Solution**

Technology is the prime factor that leads the development of a society. The devices that are used in the day-to-day life of the individual person of society include mobile devices (commercial and personal use). It can help the people in the society in information collection such as the application of mobile devices. The question is how the information can be processed through such information systems. A basic example used by the researcher is of webcam (camera) found in mobile phones, computers and laptops. It can be noted that webcams can help to capture different information sources that can range from simple gestures to facial expressions of a

person. Similarly, there are also other major devices such as the wearable devices that can help in capturing psychological information that are more complex such as activities undertaken (exercise), places visited or the actions. Furthermore, wearable devices are able to detect individual through voice recognition or facial recognition. By capturing the psychological responses used for measurement of vital signs of the body such as heart rates and the simulation of the nervous system, technology supports the human beings. Each aspect of wearable technology from measuring time to psychological changes in the body are captured and analysed. An example is the use of wearable technology in detecting heartbeat or respiratory rates by measuring the vibrations in the body (measured by camera) along with an accelerometer and gyroscope. The above examples are some practical considerations in the development of super smart society or the society 5.0 which is geared through the practical application of technology solutions and innovations applied across diverse sectors in the society. Some of the solutions from the development of society 5.0 in Japan is driven by the motivation that though there is no sufficient or comprehensive study in this research area, this research will try to identify the gaps to support the digital transformation. The solutions proposed include:

***Manufacturing Industry Transformation*** - Moving from a traditional (simple sales process) into a developed (making a gain through the services and the entire process that includes the sales care process) system, the embodiment of the mass manufacturing as per the demand while meeting the customer needs is crucial.

***Combined vehicle and manual driving*** – Pairing advancement in vehicle technology with smartphone technology to develop fully automated cars that address customer driving requirements in a smart way.

***Health Management through Wearable Technology*** – Wearable technology has the potential to support and boost the health management aspects through integration of features with health management system, leading to effective monitoring and treatment.

***Fin Tech*** – The application of communication and IT can support financial business process by developing the services and efficiency in decision making.

***People Repair (Increasing the strength of every person)*** – Every individual in the society (old as well as females) should be able to live a safe and healthy life with each having a clear vision.

***Organizations Repair (serve a developed value)*** – A developed society is supported by a developed business model. Hence, promoting the repair organizations in creating value through innovation and globalized processes can aid society 5.0 formation.

***Solve issues of the society (Make the outcomes)*** – A society can be marred by various issues ranging from declining population, the ageing of the society to natural disasters. Hence, by resolving these issues can strengthen the society and ensure continuous future growth.

***Develop rules to encourage data applications and its uses*** – with data being a prime factor in technology application, regulations are crucial to be established. There are various sectors that are related to the speed of the data services are such as distribution process, quality, quantity and the use as well as the application of the data. Therefore those aspects are not only related to the data services but also linked with the comfort zone of individual person but it also provides competitiveness to the business organisations as well as to the nation. Hence, by strengthening regulations and repair the system, there is a chance within the present regulations to obstruct the innovation. Also, the reforming process should be implemented taking into account the feedback from the citizens through administrative digitization promotion and examination of the intellectual wealth that are related to the legislative system.



***Promotional Technologies*** –This is one of the important aspects to strengthen the technological aspects such cybersecurity, artificial intelligence techniques, robotics, nanoscience, biosciences and systems science and techniques.

***Improving Innovation environment in technology & science*** – Every individual is able to create their personal value. However, to achieve it, there is the requirement of the economy that can help by facilitating the expressions and the results that are gathered through the personal value. This includes SIP: Innovative Promotion Program of cross-ministerial strategies and ImPACT: Impulsing Paradigm Changes by the Disruptive Technologies.

***Educational reform towards the dynamic participation of all citizens*** - It is essential that all citizens become "a humane who thinks internally and creates developed grade with the combination of various elements at the time of working with the others". It is one of the major factors in order to provide the education to the individual person in the process of enhancing as well as improving the information literacy of the technological knowledge from all the levels. This includes primary and secondary education that are also needed in the promotion of the learning.

***Occupational mortal savings insurance*** - There is an urgent issue of securing and strengthening cybersecurity, standardisation process in the international aspect, data that are related with science are one of the essential parts in order to achieve developed economy.

#### **1.4 Research Aim**

The aim of this research is optimization and verification of the extent of Society 5.0 can work in the service of human and the elderly, balancing economic progress and solving social problems through the integration of Cyberspace and Physical Space (CPS). It includes governance,

activation, capacity development and application along with facilitation of infrastructure development required, and reduce the annual cost on government services by 50%.

### **Research Objectives:**

- To identify the factors that drive the implementation of society 5.0
- To evaluate the practical application of society 5.0 implementation and the benefits it offers to the country
- To examine how society 5.0 support mobility, healthcare & caregiving, agriculture, and disaster prevention sectors thereby leading to a smart services society

### **1.5 Methodology**

The first step of the research methodology is to review the events on the achievements of science in the field of artificial intelligence and people's dependence. In the process of the achievement of the innovativeness within the society through the society 5.0, it serves the society within the stagnation process where the members are enjoying the respect process of each other. In that context, it can be noted that the reform process of the society is going beyond the generations of the society through which individual person can be able to lead the active as well as a pleasant lifestyle. In the above content, it can be noted that within the society 5.0, the developed values are created through the implementation of the innovativeness that can help in the elimination process of different aspects. This includes regional gaps, age, language and gender and also helps in the provisioning process of the services and the products that are related with particular need of the individual person. Therefore, with the help of the development process, the underlying requirements of the society are also mitigated. Furthermore, it can be noted that through the help

of this development process, the achievement of the capable society being able in the promotion of the economic development and findings solutions for social problems can be achieved.

It is important to develop human capacities and change the world we live in. We know that the UAE is always ahead in many areas, including technology, the UAE wants to be involved in this field and ahead of the world. Initiative X10, for example, aims to be 10 years faster than the world. There are future accelerators. The rational leadership always looks forward to the future with a very positive outlook, so that it will take precedence and global leadership in this subject. These attitudes will be examined through collection of data from questionnaires involving people, companies and university students.

### **1.6 New Value Contributed by Society 5.0 in Various Field**

**Mobility** - In Society 5.0, a new value can be generated in the following ways by analysing the artificial intelligence of big data in a database covering various types of information, including sensor data from cars and real-time information on weather, traffic, accommodation, food, drink and personal history will be achieved. This includes:

- Making travel and sightseeing easy by providing sightseeing methods that match personal preferences and suggest optimal plans that take into consideration weather and congestion
- Making movement enjoyable without congestion and reducing accidents through self-driving and combining cars service and public transportation for smooth operations; and
- Enabling the elderly and physically disabled to move on their own by using self-driving wheelchairs.

Furthermore, for the community as a whole, these solutions will help reduce CO<sub>2</sub> emissions by public transport enterprises while promoting regional revitalization and stimulating consumption.

**Healthcare and Caregiving** - In Society 5.0, a new value can be through the analysis of artificial intelligence of big data covering aspects such as physiological personal data in the real-time, healthcare location information, treatment/infection information, and environmental information. It will benefit by:

- Making it easy for a person to live comfortably by using robots to provide living support and conversation partners.
- Promote healthy life and early detection of diseases through automatically medical tests in the real-time.
- Through physiological and medical data we can provide optimal treatment anywhere.
- To reduce the burden of health care and to provide on-site care using robots.

Furthermore, for the community as a whole, these solutions will help to reduce the social costs associated with healthcare, care and solve the problems of under-employment in health-care settings.

**Manufacturing** - In Society 5.0, a new value can be generated by applying big data analysis for aspects such as customer and consumer request, inventory information, and delivery information.

It will allow:

- Implementing flexible inventory planning and management in response to current needs by establishing linkages with other fields and suppliers of the industry outside normal business transactions.

- Use artificial intelligence and robots and apply coordination between factories to make production more efficient and provide work and enable the inheritance of technical skills (master craftsmanship modelling) and achieve production high-mix and low volume.
- Make the distribution more efficient by means of the cooperative shipping industry, truck platooning.
- Enable customers and consumers also to get low-priced items without delaying delivery according to needs.

Furthermore, for society as a whole, these solutions can help enhance industrial competitiveness, increase disaster response, alleviate the problem of under-employment, address diverse needs, reduce greenhouse gas (GHG) emissions and expenditures, improve customer satisfaction and stimulate consumption.

**Agriculture** - In Society 5.0, a new value can be generated through application of AI and big data for aspects such as meteorological data, crop growth data, market conditions, food trends and needs. By achieving smart agriculture, an increased opportunity for employment and high productivity is possible through solutions such as robot tractors and automating the integration of crop data through drones. Other applications include operation and automating management of water and improves its ability based on weather forecasting and groundwater data. This will lead to:

- Formulating a plan for agriculture by identifying crop yields tailored to meet needs and improving business plans along with weather forecasts, sharing experiences and knowledge, and broadening the customer base.
- Making agricultural products required by consumers available to them when desired
- Delivery of agricultural products to consumers when needed through self-driving vehicles

Furthermore, for society as a whole, these solutions can help increase food production, stabilize supply, solve labour shortages in agricultural areas, reduce food waste and stimulate consumption.

**Food products** - In Society 5.0, a new value can be generated for aspects of personal sensitivity and information on food products and food products stored in family refrigerators, retail stores and market conditions. Other benefits includes:

- Make the purchase of food appropriate by providing consumers with suggestions on food products specifically designed for sensitive information and personal preferences.
- Reduce waste by automating the food department stored in refrigerators and enabling orders and purchases of the required food only.
- Make food enjoyable by making suggestions related to cooking based on family preferences or daily health status.
- Enable farm producers and retail stores to manage production, orders and inventory according to customer needs.

Furthermore, for society as a whole, these solutions can help reduce food waste and make the food industry more competitive.

**Disaster Prevention** - In Society 5.0, a new value can be generated through monitoring of disaster-affected areas by satellite, land-based radar, drones or structural damage information, sensors and information on road damage from vehicles. Other benefits includes:

- Provide each person with information on shelter and relief through individual Smartphone and other devices based on the circumstances of disasters and the safe transfer of people to shelters.

- The victims are immediately discovered through the assist suits, rescue robots and so forth and rescue them from buildings damaged by disasters quickly.
- Implementation of the ideal delivery of relief materials through drones and vehicles delivery of self-driving.

Furthermore, for society as a whole, these solutions can help reduce damage and achieve early recovery.

**Energy** - In Society 5.0, a new value can be generated in aspects such as meteorological data, operating status of power plants, discharge status/charging of electric vehicles (EV) and energy use conditions of each household. Other benefits includes:

- Provide stable energy supply through various energy sources based on accurate forecasts of demand and weather forecasts.
- Achieve domestic production for domestic consumption by taking advantage of electric vehicles (EV) Producing hydrogen and promoting regional residence.
- Enhance energy savings by each family by offering proposals to improve energy use based on supply predictions.

Furthermore, for society as a whole, these solutions can help to provide a stable energy supply and reduce environmental load by decreasing GHG emissions.

**Cyber Space** - In addition to official procedures and services in the country and arbitration over network, the subject of cyberspace remains very broad and includes all political, economic, social and security activities, advanced communications systems, physical transactions, internal and international bank transfers. It also includes commercial transactions, such as electronic

signature and stock exchange transactions, which represent topics that are relevant fundamental in:

- Electronic transactions in all public and private institutions as well as all commercial establishments and local and international stock exchanges in various great trading countries.
- Protection of data and information in public, private and individual institutions from cybercrime that may be caused by the use of computers and web networks.
- All electronic communications, especially the internal security of the State, freedom of expression through electronic means, especially media and social networking sites (Facebook, Twitter, and other means).
- Protect intellectual property rights especially for writers, poets and artists who present their work on the Internet and the rules of evidence and the origins of trials.
- Combating terrorism on the Internet, especially spreading jihadist ideas and encouraging violence, murder or threats, the neutrality of the Internet, criminal investigation on the computer.
- Electronic transactions and electronic signatures, which will be handled by business leaders across the world to match the era of technology and communications and economic globalization.

Combining cybersecurity, programming, and artificial intelligence to build a knowledge and technology community that compete with developed world countries in IT innovation.

### **1.7 Operational process of Society 5.0**



The high degree of coverage among the cyberspace and the physical space are achieved through the society 5.0. Through the help of the previous information regarding the society, it is observed that the people are accessing cloud services within cyberspace with the help of the internet technology to search, retrieve and analyse information gathered (Shiroishi et al., 2018).

Therefore, within the society 5.0, a large information source gathered through sensors in the physical space of cybersecurity system will bring about large-scale development (Skobelev and Borovik, 2017). This will work in alignment with big data and artificial intelligence enabling the analysis process thereby supporting the human beings in different forms. It will bring about a unique network of people, system and things by connecting them and traversing beyond capabilities of human beings and physical space. However, this development process also brings developed values to the society and to the industry in the form of innovative way which was once found to be not possible.

### **What are the needs for the Smart Services of the society?**

#### ***The organization, Data Sharing and technology***

The data sharing, organisation and the technological development process are aimed at the development process of the life cycle standards of society people through the help of the developed technological power (Hayashi et al., 2017). Therefore, the development process also assumed that the smart services of those devices are aiming in the development process of the quality of the life of human beings by not only increasing the technological strength but also increasing the part of the services which still needs the development process.

Various researchers are found to be working on the so-called services of science as well as the services of the engineering system where the services are included with the interaction of human

beings and also with the interaction with the robots or the non-human beings (Hayashi et al., 2017; Fujii et al., 2018; Shiroishi et al., 2018). The operations of the human beings are included by the engineering systems within the interaction process among the man and the machine or within the interaction process among man and environment that developed the interaction process within the space of the smarter services. It is believed that the interaction process is one of the keywords in order to understand the intelligence services that can be achieved. Therefore the process of interaction is a multi-application process where the human beings, as well as the machines, are involved in the case of the diversification and the sophistication process of the elements (Fujii et al., 2018).

This research process is capable to feed the agenda of developing super smart services (society 5.0) for approximately 10-20 years in the process. The process of interactions is equal with the sharing process of the information among the participating agents (Keidanren., 2016). Thus with such participation, the interaction process is comes into contact with the participants that includes the exchange process of information among the individual parties as well as the vice versa (Fujii et al., 2018). Furthermore, it can be noted that within the process of the exchange of information, there is the presence of interaction. Here, the question is *'what types of techniques are associated with smart technology (artificial intelligence) necessary to support the interaction of human beings with other factors?'*

Firstly: The infrastructure of the society (to be safe & comfortable), work is required for acquiring different opportunities in terms of mobility and different improvements based on providing a that smooth, comfortable and safe working within the interaction process.

Secondly: The technologies that can help human beings in retrieval of the conceptual information through the effective ways involving different incidental documents such as large videos, enhancement of the interaction process.

Thirdly: To assist within the production of particular non-linguistic and linguistic information in that are limited within the times of unique contexts.

In respect to the upper suggestions, it can be noted that the suggestions are not applicable on the basis of the present technologies of intelligence services or in the context of the interpersonal level (Skobelev and Borovik, 2017). The techniques that can help people in case of the manipulation of the different goals and the perspectives within the task rather than within the present limitations of the human mind, knowledge, science has built research field called "theory of the mind" (Prasetyo and Arman, 2017; Borja, 2016). Therefore the theory of mind can help to build different theoretical models of technologies that also can help in the improvement process of the human mind through the different aspects. This includes increasing ability of the reading, the analysis of the meaning of the works to infer the activities, desires, cognitive goals and intentions of mind (Leitão, Colombo and Karnouskos, 2016). However there is the presence of the fine line of walking within the creation process of the artificial ideal of the information system of human mind and it also helps in the process of promotion of working agenda in order to balance the different activities like ethical balance, issues of the social and legal issues. There are also concerns with the future predictions of ICT technology, primarily with the use of smart technology for everyday application until 2025 (Hayashi et al., 2017). Examples include developing of clothes that are equipped with smart features such as being connected to internet or using cloud to charge mobile phones that is used in the -terabyte sensors as one of the standard connectivity and techniques for the internet system. The process also includes the use of

technology printing of three dimensions, automatic driving car and the signal lights that are required for the developed cities. Amongst the other things that can be learnt from techniques AT, BD, IOT Technology is that it should be compatible with the near future (Collins and Halverson, 2018). The technologies must be in sync with human interaction based on computer, along with big data, development of human resources and security. A point to note is the inter-relation between cognitive computing technology and artificial intelligence, which are highly interdependent. Therefore, artificial intelligence systems focus on developed devices with capacity to augment with cognitive science and intelligence for practical implementation for smart operations and smart people.

Within the development of smart people, there exists augmented theory – a theme that can bind different technologies and bring about significant breakthroughs in blockchain as a trustable economy (Hernandez et al., 2014; McDuff and Kaliouby, 2016). It is a form of crypto ledger to make smart transactions that are auditable. When bringing together future of society and science, various components exist in the form of cognitive, service and natural systems. These systems can provide benefit to the society 5.0 from the deeper perspectives of studies of science with the collaboration of smart devices (Collins and Halverson, 2018; Picard, 2014). Thus the benefited systems are interrelated with the efforts that can help in the service system of the developed services. Furthermore, it can be noted that the industry, as well as the players from various universities, are working together along with scientists and economist collaborating with computer scientists and engineers to advance in the study of service systems within the society 5.0 domain.

***Sensation as a Ministration: An Understanding of Cognitive Systems, Industry Perspectives***

The augmented intelligence and its approaches can help in the process of emphasising the importance of the study of science and psychology, while lending importance to the cognitive systems designing process considering people and values of the business to make a difference. It is predicted that by 2035 a majority of people of the society may have their “cognitive meditators” allowing people in the society to communicate approximately 100 times better than the present speed of communication. In addition to this, it can be noted that the increased speed of speaking can help in the cognitive mediation process which similar people are looking for more opportunities simultaneously to collaborate or create values with an individual person or with other (Hayashi et al., 2017). In society 5.0, commonplace realities will be flourishing. This includes instances wherein cars would be self-driving, mandatory water recycling at the city level, manufacturing locally instead of abroad due to robots, three-dimensional printing systems, plasma and artificial leaf and building faster buildings that include various materials that are advanced in different sectors such as safety, energy, healthy living and varies technological intelligent communication.

## **Chapter 2: Literature Review**

In this chapter, a detailed evaluation of society 5.0 is presented along with its advantages and disadvantages. An examination of the factors influencing the integration of artificial intelligence into society 5.0 is undertaken followed by a review of effect of artificial systems and its impact on our lives. The chapter also discusses society 5.0 in perspective of devices and systems, the design process for service systems and the social impact it has. At the end, a review of the transforming human into a smart human is presented along with interference on the research subject.

### **2.1 Introduction**

While developing the technical aspects focus is given on assessing what is the attitude of end-user towards technological usage. This aids in identifying the strengths and weakness of facilities and finding out the requirements related to the development of technical perception (Larson, 2016). The present discussion has been done with respect to society 5.0 perception. Its working principle focuses on developing the infrastructure for solutions provinces in services platform. The focus of this section is thus on addressing the challenges faced in legal, social, moral, safety and privacy grounds so as to aid in making a valuable contribution to the social aspects.

### **The impact of information technology and communication on the community and learning**

In the present times, the reflection of big data is majorly on how advanced technical subjects are linked to our daily activities. These technical systems are thus used to explain working dimensions of all the subjects such as the molecular diameter of water as well as the distance present between the Sun and Jupiter. Technical aspects of LoT are thus combined with cloud storage facility so as to develop working assumptions of smart cities all over the world. The working principles of IoT based technical aspects are based upon verifying how physical spaces

are connected with the internet. Things such as data, processes, artifacts and even human beings are linked with the internet in order to share or interchange information and also for creating value (Stankovic, 2014). Robotic services utilized in Cyber-physical spaces has got a presence of 3 main functions being intelligent, actuation and sensation controls. These are utilized for designing the physical layouts that form the basis for initiating the entire appliance of robotic spaces in smart cities (Leitão, Colombo and Karnouskos, 2016). There is also an involvement of sensory function for providing the most efficient physical appliances in the development of the smart city.

## **2.2 Cognitions as a Service (CaaS)**

The idea of society 5.0 was started by the Japanese government as technical appliances of ICT are utilized for developing the living styles of the citizens (Sugimoto, 2014). Other than this, it is also being used in other aspects of Japanese economy such as healthcare, transport, industry, and education.

### **Education Data Science**

The perception of ICT has also brought a change in the digital revolution in the education sector. For example, when we talk about higher education then students' nowadays have to interact with many electronic tools to fulfil their learning and writing requirement. For instance, there is a facility for online courses and E-learning that assists the students in reading and writing about the overall significance of their departmental subjects (Hoc, 2001). These systems are most popular nowadays as the interaction can be done by the student at more than one place and at any time. The overall learning objective of students has not only been fulfilled by interacting via online portals but also through physical items like smartphone and tablets (Collins and Halverson, 2018). There has thus been an increase in the overall strength of students to learn the subjects.

The above-mentioned association of technical aspects in education has altered the teaching principles and methods. This has thus led to the creation of a shared intersection between the learner and related subjects such as cognitive science, psychology, and computer (Borja, 2016). Kyushu University has begun a policy where all students studying in the year 2013 are required to bring their own device. The university provides e-books followed by an e-learning and e-wallet system to all the students. This has led to a collection of more than 180000 learning data records from the learning activities of UG students that happen on a daily basis (Ogata, 2015). The records are then analysed by the teachers to improve their way and style of teaching. Assistance is further provided to the teachers by Centre for Analytical Education who provides feedback and gives tips for improving the performance of students.

### **2.3 How artificial intelligence changes our lives**

The advantages from the digital systems are activated sensing and responding for the changes in the human's emotions. For determining the human's emotions, identification of facial expression, physiological responses, a tone of the persona and contextual information enrich the picture frame upon stating the emotional state of the current person (Borja, 2016). Also, the deep learning of the machine languages is also helping in improving the allocated performances of the systems, that further improves the response factors initiated by the intelligent machine (Larson, 2016; Sugimoto, 2014). This lead to further increase in the abilities of the artificial intelligence working principles to catch and recognize the emotional status of the humans. The activities deployed by the sensors are also contributing to the focus upon enhancing the artificial intelligence attributes. The sensors are the prime applications used to collect data needed to be intercepted in the real field applications of the objectives. The physical devices are not only associated with identification of the physical emotions of the people but also ensure the



applications for improvement of the wellness and health of the users (Stankovic, 2014). This smart interception of this particular artificial intelligences are not only assisting upon the reliable collections of data through the capturing process but also ensures that the working perceptions of the devices are held towards the development of the smart cities actions (Keidanren, 2016; Shiroishi et al., 2018). The application of the artificial intelligence is not only for acting on collecting the relevant principles for capturing process, but also to aid in interacting upon the communications purposes (Hayashi et al., 2017). Most instances, applications, such as, instead of keyboard types, the users can contribute the voices words that further transferred into the particular words that are announced or relevant to the announced words.

## **2.4 Devices and Services**

In our day-to-day lives, the role of emotions is not hidden. They support us by influencing our memory, assist in decision-making, wellbeing and communication as well. Human beings make use of signals (verbal and non-verbal) that contain information derived from the intentions, well being and affective state of self. These signals within the social space are utilized for effective communication leading to improved social engagement and transcribed through aspects such as gestures, facial expression, language or speech (Picard, 2010; Ogata, 2015). Human affective states can be effectively perceived through ubiquitous devices that are supported with cameras or other hardware (Zeng et al., 2009). Controlled interfaces assisted through voice or gestures are also gaining popularity, and so is the speech control interface available on various smart phones these days. Other relevant contributions of the activities are mostly aimed towards improving the sensing purposes so that the better accuracy upon the working principles can be allocated for the users. All these points add up to the strengths of Artificial Emotional Intelligence (Stankovic, 2014; Hernandez et al., 2014).

The field of effective computing, as it is called for emotional interface building, has evolved with the growth of IEEE – a body concerning the development of research in artificial intelligence. Considerable research have been made on this field for real applications in order to effectively analyse and interpret the emotions of individuals (Picard, 2010). With the past devices, capturing emotion signals was difficult however, with the growth in technology as of today, it is much easier to not only capture, but also to process into meaningful aspects within real time (Collins and Halverson, 2018). Also, companies today are aiming to build such computing technology for commercializing it in various forms which can be a voice analysis or a simple facial expression. Such emotion based technology / software has a huge market to capture.

Devices with the capability to analyse emotions have a great potential in the current world and focus on improving the ways technology is sought for human interaction be it for home or work or for entertainment purposes (Hernandez et al., 2014; Woolf et al., 2010). Emotion based applications such as games that respond to non-verbal emotions or health based applications have the ability to track and manage patterns of emotions and behaviour for their respective services/products which can have a future of success. In a matter of no time, technology will emerge in ways that we can think about and far beyond the current application. As an effect, the intelligent applications such as Siri, Cortana and Alexa come under service that is used to understand the emotional demands of the users (McDuff and Kaliouby, 2016). In such systems, the application works to interpret emotion based signals along with the perception of language, thereby adding to the strength to successful advice as human assistants. For example, while users prescribed to play a certain song on any of these application, the devices manages to initiate a music data search through the internet and then play as per the demands of the users (Woolf et al., 2010). The application of such as task objective is not only bounded to a particular slot i.e.

music but also has a varied number of other relevant contributions in the real-life application which is a capability of artificial intelligences applications found today. An other example of such application is to provide the services upon the electricity supplies, so that in the absence of the user, the remote controlling facility is allocated with the main devices that ensure the application of the working principles, with the device implicated to perform in the real act (Woolf et al., 2010; Stankovic, 2014).

Smart technology applications of today, as above-prescribed devices, are not limited with the application of only identifying the clients need, but also the attached emotional requirements of the users. This further helps in comparing the acts contribute to improving the service offered and what are the forces to act upon (McDuff and Kaliouby, 2016). In the future, it may be possible to "tune" the service that is based on the individual experience or change the way the service is provided on real-time feedback about customer sentiment. This can further change the relationship between the company and its consumers for making it more personal while bringing out greater possibilities for understanding for example how a treatment and medical condition affects the patient's behaviour in real time from the quantitative measurement (Valstar, 2014). In terms of further developing the social implications of services and devices for measuring and acting upon human's emotions is needed. A shift can be noted on how people are attached with their devices and how it contributes to their requirements. Alternatively, the computing technological aspects play a pivotal role in better understanding the behaviours and emotional attachments of the person with his/her device. Analysing and recording the physiological or behavioural information related to people bring out the matter of data privacy and sensitivity. The data obtained is very personal and in many cases, can be identifiable. Hence, it is vital to discuss the required social norms supporting its usage and abuse of use.

## **2.5 Innovative Organizations and Micro Services toward API Economy**

Technology advancement has seen many innovative businesses consider API economy as one of the most important considerations in daily operations. The API concept consists of creating a new integrated system functionality by combining existing or new enterprising systems that act as the digital glue linking services, applications, and other systems (Ahsan et al., 2016; Botha and Triegaardt, 2016). Therefore, each business intends to make their data an asset, and the most reliable way of accomplishing this is by externally providing that data and know-how through Application Programming Interfaces (APIs). Examples of APIs existing currently include; speech recognition, image recognition, and even accounting, which are cleverly packaged together with other associated services by many companies. Provision of API services has made it possible to accomplish mobile applications without servers, and in so doing introducing new application services to the growing consumer market (Fujii et al., 2018; Juhariand and Izhar, 2018). The financial effects of APIs on businesses continue to emerge and grow due to new social media and mobile technology. In fact, large technology companies gain revenue by providing their APIs as major building blocks for third-party businesses and application (Hayashi et al., 2017; Makhwathana, Mudzielwana and Mulovhedzi, 2017). Some of the notable companies in API include Salesforce, Airtable, Google, Amazon, Facebook, and Netflix.

## **2.6 Design of Service System**

There has been a proposal of 2 important design principles for service system for realizing Services for the future in the form of Society 5.0. The first principle is all about implementing the mechanism and structure for co-creating value into the design (Rey et al., 2016). This co-creation happens as a consumer is regarded as a crucial resource in the service-dominant economy of present times. The second principle is to carry out system designing by focusing on

its dyad structure that conflict between varied requirements and processes. This is also one of the major features of a socio-technical system that has a presence of diverse elements. Usage of the above-mentioned principles will allow the design activity to reach at the next level. As discussed in Service Dominant Logic, it has been stated that operant resource being the skill and knowledge become the dominant resource in comparison to operand resource (physical goods and natural reserves) (Larson, 2016). If skill and knowledge become the dominant resource then the role of consumer also changes to proactive one as an operant resource can be delivered by consumers as well while operand resource can be given by providers being the company when we talk about transaction taking place in value creation system. However, the change in the consumer is merely from a customer of value to the one who co-created the value. Hence the creation of “customer as an operant resource generates a new process being co-creation of value in a given service system (Medina-Borja, 2015). Co-creation of value is only possible when the service system has a presence of structure and mechanism. This aspect should be given special focus in the design phase to avoid any issues in near future.

When we talk about goods dominant economy then physical goods are the major target of any economic transaction. This makes logistics of physical goods as an important social infrastructure to aid in value distribution. As discussed above, skill and knowledge play the dominant resource for economic growth in the service economy hence major social infrastructure, in this case, is the delivery mechanism of knowledge and skill set (Pouliquen-Lardy et al., 2016). This explains the reason as to why ICT who is an efficient carrier of skill set and knowledge has become an important social infrastructure when it comes to service dominant economy. The 2nd design principle being the design of dyad structure happened on account of the observation made on a research program of Japanese government meant for service science

(Service Science, Solutions and Foundation, Integrated Research Program). The program started from 2010 and continued till 2016 and has been regarded as the one that received its 1st national grant for SSME in the nation. The program had an aim to create technology and methods for solving precise and emerging issues of service sector followed by establishing a research center for Service Science. The research in service science was of two types being Type A (solution-oriented) and Type B (foundation-oriented). A grant has been received for 18 projects in a span of 3 years that belong to various fields such as education, travel and tourism, healthcare, hospitality, and public service (Flemisch et al., 2014; Hayashi et al., 2017).

One of research outcome of the program is to clear the value category of the service system and develop evaluation techniques through a type of social science analysis based on data for business transaction and behavior change within the stakeholders (Skobelev and Borovik, 2017). The research was carried out in the banking service system as it aids in the continuous growth of every stakeholder while being in a long-term relationship in comparison to providing 1-time victory of any commercial transaction. The 2nd research outcome is to create visualization and improvement methods of skill and knowledge attainment by a realizing process to identify the awareness of people. This research was carried out in a care home as skill management of nurses is very crucial to aid in providing a quality service to patients. Another example of research outcome is to create a service design technology that is based on engineering principles. The need here is to involve consumer and organizational knowledge in the design process. The given project made an attempt to innovate the tour business where a rapid surge has been seen in free independent travellers.

On the basis of the observation made for the service science research program for a span of six years it is quite clear that there is an existence of dyad structure in a service system which is

featured by conflicting processes such as rationality or irrationality, mental or physical process and even objectivity or subjectivity. Moreover due to the socio-technical nature of service system which is composed of diverse elements the designers have to face the above mentioned conflicting requirements as reflected by the dyad structure. As per past and present design with respect to social and service system, just one side of the dyad is focussed on in a single design activity. This is as a designer has to work in one or just a few academic disciplines that can cover just 1 side of a dyad structure. Hence realization of Future Services and Societal Systems in Society 5.0 can only be done when systematic design, as well as management of dyad, is focussed upon.

## **2.7 Social Impact and its Concern**

Our goal is in the future of the super smart society 5.0 that has already being implemented by the government of Japan. The country has most conducive attributions towards to innovation in the globe (Shiroishi et al., 2018). The unprecedented high-speed results in developing the society for implementing the innovative technology permeated the social lives as our citizens are mandatory to face the mass flow in goods influences along with the environment in daily lives (Keidanren, 2016; Fujii et al., 2018). The importance of the issues are facilitated by the ethical, legal and social challenges that result from the implementing the leading technology for the societies development, and that brings out the beyond issues of treatment and quick actions to catch up. The fundamental points of economic, legal, robotic, technological, and financing have been integrated into the implementation of a process that would lead to a form of evidence for counting the current situation (Prasetyo and Arman, 2017). Societies must carefully think about social adaptation to deal with scientific solutions to meet ethical, legal and social challenges and confront them. Further realization on the technology itself should develop a technical viewpoint

without the overview of perspective real users' opinions or acceptance (Borja, 2016). It is suggested that for knowing the existence of multiple stakeholders creates millions of unprecedented situations that are complex in nature. Societies must also not forget the development of the societies aspects as per the societies 5.0 that will certainly have to test unanticipated effects through innovative network-related techniques (Leitão et al., 2016).

## **2.8 Smart Human of the Future**

The service sector is continually changing, and with it, service systems must also change to accommodate new needs in the sector. On major concern about the evolution of service, systems are the need to create system designs that solve the most important issues affecting humanity at the moment. Unfortunately, the human factor is often ignored when designing these systems, with many engineers failing to consider the interaction between humans and the system (Markoff, 2015). The undeniable fact is that machines must work together with humans in some capacity, even when machines replace human labor as in automation, the human aspect still remains as the systems still need programmers. In any case, automation has already replaced so much human capital in the service sector leaving many people jobless. Therefore, the effect of systems in the service sector, especially in developing nations, must not be ignored.

Luckily, the solution to these conundrum exists in seeking to achieve a true and flawless cooperation between humans and the service systems. A great example is found in the healthcare and education sectors, where a clear divide between human and machine contribution is stated. Human contributes in ways such as social skills, synthesis, a creativity, while systems handle matters relating to data processing, and precision. This kind of co-operation was perfected in the 190s and is termed as joint cognitive systems, wherein development of systems, engineers designed systems to provide expert knowledge as well as included a design for interaction with



the human decision maker (Hollnagel & Woods, 1983). Currently, technology has advanced in terms of intelligent, but human interaction is a difficult engineering problem. Success with current machines would include designing the systems to adapt in order to respond to human interaction seamlessly and still fulfill its functionality. Hoc (2001) attempted to conduct an extensive review of existing literature on human-machine cooperation, as well as define, and differentiate cooperation and the highlight the cognitive approach followed to design interactions. Other authors on the same topic have utilized this review to build insights into automation, reality, control, and ergonomics (Flemisch et al., 2014; Pouliquen et al., 2016, and Hoc & Amalberti, 2007).

It is important that engineers and scientists improve the operations of service systems by achieving the ideal design of service systems. This involves finding the right configuration that would allow humans and machines to interact by incorporating various human characteristics in the original design at different levels. One of the best ways to accomplish this is by identifying the roles of each party. Human beings are better at interactions, intuition, empathy, and complex decision making while machines excel at the identification of patterns, processing of data, calculations, and data search. The goals are that future machines and smart devices will improve human life and work (Medina-Borja, 2015). There is a need for new interdisciplinary research between science and engineering with the aim of developing the perfect human-technology collaboration in machine technology.

The goal of this paper is to advance this agenda and achieve a smart world, which is beneficial for all facets of society. The need for true convergence between computational technology, behavioral and cognitive sciences and technology is imperative. Considering all aspects from a research aspect, it is necessary to begin by new discoveries and modeling approaches that

include the existing scientific understanding of cognition, behavior, perception, actions, and intuition of human interactions in the engineering machines. The Barsalou's Perceptual Symbol System theory indicates that perceptual symbols are records of the neural states underlying perceptions. This means that the brain uses active configurations of neurons to represent the characteristics of perceived events, and items (Barsalou, 1999). This is a huge leap in research in human-machine cooperation, as it indicates that human beings actually mentally simulate or re-enact events that they are living in or experience, therefore, continuing research is looking at the possibility of reactivating motions in the hope of influencing human cognitive abilities (Rey et al., 2016). Findings found in such research would play a huge role in helping cognitive scientists, computational experts, and systems engineers in developing devices that allow for faster classification of items by human beings. Such possibilities could be useful in increasing workplace productivity due to better and faster visual recognition. Unfortunately, few systems engineers are aware of this and other existing cognitive as well as behavioral theories. Secondly, there is a need to evaluate the processes and the ensuing performance of the smart service systems. Currently, the optimization algorithms available look at humans as a combination of data patterns, probabilities, utility, and states. The measurements fail to consider human variability and sporadic behavior, termed as adaptive role and urgency systems that affect human interaction (Larson, 2016). This makes it impossible to measure productivity, a success of these systems without new mathematical frameworks that incorporate human variability. Lastly, there is a need for a more long-term research to codify the new discoveries as they happen. And then integrate them into engineering teaching and practice. The new discoveries will inform other areas in building systems such as in designing the systems especially in larger systems. The new systems emerging from such discoveries will utilize the best qualities of humans and the

engineered systems, leading to highly productive human-machine interactions. These systems will be important in designing of cities of the future, which will guarantee a high quality of life for all citizens. Unfortunately, there is a poor understanding of designing these cities and there need for work on people overcoming a few demographic and behavioral challenges to ensure there is access for all (Larson, 2016).

It is expected that in the coming decade, robotic and artificial systems will be more intelligent than the most recent models available currently. Research continuing on autonomous systems will enable more individual autonomy previously impossible with older models. Furthermore, the near future smart systems will interact with humans to offer value and become de-facto service providers. This means that the concept of service systems will exponentially expand beyond the current confines. This fact alone introduces new social implications, with the first being that there is currently a need for regulation, ethics, and policy meant to protect the society. Some of the considerations include privacy and safety which is an important issue for many global governments. Unfortunately, many of the policies are not well informed on the scope and level of intelligence of these systems with the aim of reaching optimal functionality, which makes it impossible to promise total privacy or safety. More importantly, is the fact that in order to enable expansion of these systems, there needs to be a better solution of ensuring privacy and safety of humans. Additionally, smart technologies can shift the economic landscape easily and in many different ways. For example, the capability to design your footwear, send it for fabrication to a shoemaker near you, and collect, will inevitably, shift the global landscape of that and many other products. Currently, many such products are manufactured in low-wage countries such as China, which will change with the introduction of this technology. The sharing

economy will cross borders, of individual ownership into the corporate space, and even between countries.

## **2.9 Fear for Autonomy**

In the practice application, the use of IoT or artificial intelligence is marred with legal aspects which can be named as the fear of autonomy – identified as one of the main issues in legal terms (Picard, 2010; Hernandez et al., 2014). Some people, for example, may have developed system fear such as surveillance systems found in public places. The usage of IoT technology for homes will increase the concern of such people towards invasion of privacy. To move over such fears for privacy, there is need to bring peace to those individual minds through clarity on technology applications and its regulations and compliance (Ogata, 2015). It is vital that much consideration is given to the rules that apply towards artificial technology applications in various environments such as workplaces, driving, and financial services, amongst others (Prasetyo, and Arman, 2017).

The use of internet technology is important in the establishing of smart society. And the benefits associated with a smart society are numerous. Despite this, the technology is not always welcome because it has both negative and positive effects. The use of technology increases the risk of abuse despite its development which was rooted in good will. And therefore, this founds the premise by which there is need to regulate the use of technology using legislation. There are two important aspects which the legislation seeks. First, it seeks to undertake a protection of human rights and second, it seeks to encourage and not in any way inhibit the progress brought on by the use of technology. However, striking a balance can be very difficult. In autumn of 2013 in Osaka Station, a public institution put up 92 digital video cameras. The goal of the exercise was to collect the facial images of the visitors as well as collect their migration path data in an automatic way (i-Scoop., 2018). The number of people visiting the station are an abundance

of 800,00 each day. Therefore, the test not only became an imperative move but also a significant step in the development of facial recognition technology and the application of technology for big data process. However, the trial was opposed by different groups including the Osaka City Council, media and newspapers and several human rights organization. The institution was restricted from taking photographs of the visitors. Rather they were only permitted to follow the movements of the dozens of employees who visited the place.

In the established Smart Society, the robots play a pivotal role in which they are set in houses and help in improving communication within the familial setting (Granrath, 2017). Not only is there automation of private conversations which are immediately stored in the cloud through these robots, reviewed by artificial intelligences and then downloaded to the robot. The cloud storage enables the storage of millions of conversations. The harmony between technology and privacy is one that requires legal intervention (Sugiyama et al., 2017). However, even with Japan is lagging almost 30years behind countries such as The United States, Canada and Europe. While these countries have an established system as of 1977 and 1984 of the Privacy Commissioner, Japan has implemented the measure which is set to begin in the next year (CeBit, 2017). More importantly, the position is granted no powers for supervision from governmental agencies. The action is quite disturbing owing that the greatest amount of personal data is held by government agencies and therefore any possible damage will result in leaking and illegal use.

In the consideration of the legal system on inventions such as the autonomous cars, we are well aware that we should fear the independence. In the event we imagine a situation in which there is a young man driving an autonomous car which is driving along a mountain road with the cliff facing the sea (Keidanren, 2016; Shiroishi et al., 2018). The presence of a human drive truck which comes from the opposite direction can result, [ if it actually went straight] in a head-on collision.

If the car turns left, it would fall in the sea while if it turned right, it would run over a woman who has a baby. The question remains what is the most appropriate choice for the car to choose? Is there a chance that the answer may change because of the presence of an 85-year old man as opposed to a younger man riding in the autonomous cars? The above-mentioned is a remodelled question dubbed in philosophical study, the 'Trolley Problem'. Based on its philosophical premise, it can be presumed that there is an excess of one correct answer. However, the question presents something which is sure. Artificial intelligence therefore must not have stabilised priority values in human life (Shiroishi et al., 2018). It does not matter if the person is young old, mother child, male or female, children, Nobel peace prize professor or even criminal no person has the choice to live or die except for God. Therefore, a part of the human race, the decision is based on a rule of priority as it applies to autonomous cars. Majority of the car manufacturers globally are called on to conform to the same rule. However, it is impossible to predict the behaviours of a car based on the disunity rules. For instance, if Toyota cars take a right, Nissan take a left and Honda goes straight in the above-mentioned situation, no individual is capable of protecting themselves. Therefore, what does the rule of priority comprise of? I believe that the first principle of the rule involves a call to "Protect the human in the car". The second principle calls for "protect the human out of the car" and finally the final principle calls for "Protect itself". However, don't you believe that the "Three Laws of Robotics" are visible in the new and the real world. In accordance with these rules, the car is best called on to jump into the sea in the event that it is empty. And it must offer protection to the 85-year old man even if the young woman with a baby gets hit in the process. However, most people have the following line of thinking and tend to ask "who compensates the young woman and the baby for the sustained injuries? However, it would seem that the compensation for such injuries is not compensated under the

present law. Reason is that no single individual has problems and no actual defects in the car. Therefore, I believe that we can create a suitable insurance system that offers compensation for any damage that is caused by autonomic cars even in the event that there are no defects ad faults. The government calls on the car owner to take on a contract with an insurance company and he/she [the owner] should contribute the cash to pay for the insurance premium.

I would also like to point out that the above mentioned issue which cause fear for the autonomous. First it the autonomous labour management system and second is the autonomous exchange or stock trading system. It is believed that the autonomous labour management system will eventually develop into rationale distribution of the working hours. Artificial intelligence not only provides a perfect shift table which provides important innovation which help to eliminate the standby times (Shiroishi et al., 2018). However, it is important to remember that the creation of a shift table can result in a reduction of the salary. Because the workers get their salary based on the working and also the waiting. Efficiently in the outsourcing system is important as it makes retirees and housewives to gain more income through teleworking. More important to remember is that the income can suffer a credible in conclusion. Because of the market, sure which remains constant, the increase in the number of workers can regrettably serve in the reduction of the working time of other labour.

## **Chapter 3: Research Methodology**

### **3.1 Introduction**

In this chapter, the researcher explored the different types of research methodologies in a bid to identify which will be most suitable to draw an effective research outline. In the previous chapter, it has been shown that there was vast knowledge taken by researchers from various bases of conceptual and theoretical models. In this research methodology, if the appropriate selection will take place by the learner, there will desired object based result will be evident.

### **3.2 Research Outline**

The data has been collected from primary and secondary sources by applying both of the methods which will analyse the impact of the implementation of Society 5.0 (Bernard. 2011; Berry et al. 2018). The primary structure for the research has been created upon the basis of that research from which the methodology can be formed that will draw the research outline properly. The learner has to go through the positivism of the philosophy of this research and the portrait of research design which will be considered in the study. Apart from that the learner also has to consider the deductive research approach for better understanding of this topic (Bryman and Bell. 2011; Creswell et al., 2017; Quilan et al., 2018). While conducting the interview and research survey, few things have to take into consideration such as the ethics of the research, and its reliability and the validity of the research (Bernstein. 2010; Hawkins and Weis et al., 2017).

### **3.3 Research online**



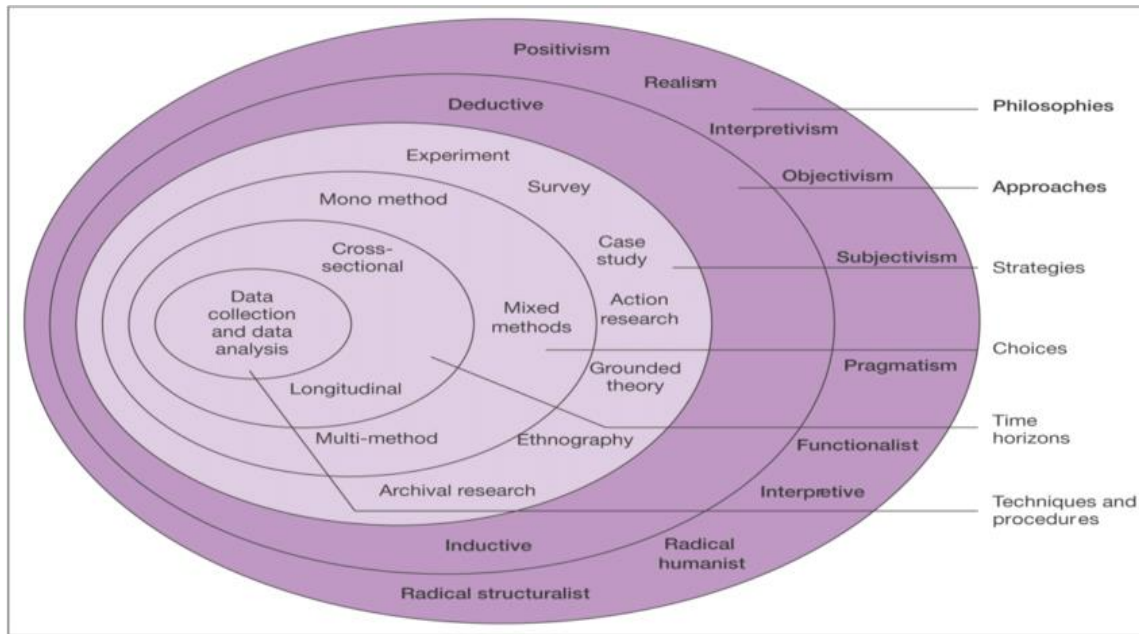


Figure 1: Research Onion

Source: Saunders et al., 2015

Through following the clans of the research online, a suitable way or path will be discovered to solve all the problems efficiently, which relate to this research (Bryman and Bell. 2011; Denzin, 2017 Lewis, 2015; Saunders et al., 2015). The description lies in relationships between sampling, the research approach, data collection methods, and the philosophy which will be applied to create an appropriate approach to adopt the dissertation of this report (Bernstein. 2010; Brannen, 2017). To conduct the study, it is essential to denote the layers of the online research. However, in the year 2011, there was an outcome of criticism of online structure by Bryman and Bell that the online research is not designed accurately. The primary step of the study, which is the collective data and its analysis part, needs to be the external component that serves as the essential aspect currently (Bernard. 2011; Matua and Van der Wal, 2015). Saunders has been developed the research online, which involves activities that focus on performing logically in research and also, it is beneficial for the study to undertake an unfolding every fold, which is laid historically in the online research (Cooper and Schindler. 2010; Saunders et al., 2015).

### **3.4 Research Paradigm**

#### **3.4.1 Research Philosophy**

The philosophy of positivism and the philosophy of interpretivist are the two elements of research philosophy (Cooper and Schindler. 2010; Leavy, 2017; Yanow and Schwartz-Shea, 2015). In the matter of dealing with the positivism part; the central job role is the problem examinations of the research based on the real evidence and truths (Cronin. 2010; Babones, 2016). The other element which is known as the interpretivist of philosophy works as an assumption or impression which people in generally carry in their mind about a particular object or subject. To analyse the positive data and research problems which figure out the facts and truth, the positivist theory is instrumental (Crouch and Pearce. 2012; Yanow, 2015).

##### **3.4.1.1 Justification of Choosing Positivism research philosophy**

The positivist philosophy is acceptable to make the investigation of truth based on the real-life truth and real evidence [which is collected by the trainee or the learner]. That is why most of the researchers choose this type of research philosophy to research any object (Crowther and Lancaster. 2012; Glesne, 2015). In the year of 2010, Schindler and Cooper have been placed an opinion that the observation application given by the learners [in the case of interpretivist philosophy] is handy to analyse the problems which occur in research based on real facts (cited in Evans, Jamal, and Foxall. 2010).

#### **3.4.2 Research Approach**

The research approach can divide into two approaches. The approaches are deductive and inductive approach. In the year 2012, the deductive approach helps to gain knowledge which is

very useful for a case study (Ferrell, Fraedrich and Ferrell. 2010; McCusker and Gunaydin, 2015). This approach helps the researchers [in a top-bottom approach after viewing the literature review] by creating an assumption about the research evidences and theories are relevant or not. The deductive and inductive approaches are related to each other. If there will be a comparison of deductive and inductive approaches, then the inductive approach will excel in those researches in which aim to create the research relevant theories (Choy, 2014; Fraser. 2013; Ledford and Gast, 2018). At the initial stage of research, this approach is constructive to build a new theory and gain knowledge.

#### **3.4.2.1 Justification of choosing deductive research approach**

The deductive approach is acceptable to the researchers after analysis of both types of research approaches (Fraser. 2013; Hart, 2018). The reason for selecting this approach is that in an existing theory, this approach helps to deduct the information from those theories which are pre-existed and models and concepts of Society 5.0 and the perceptions of the population. To this topic, the scope to develop new theories and concepts, which are relevant to the topic is very poor. However, it can be said that the inductive approach is not relevant for every topic and research through this is useful for the creation of a new topic (Ferrell, Fraedrich and Ferrell. 2010; Patten and Newhart, 2017).

#### **3.4.3 Research design**

The research design can divide into three parts which are exploratory, analytical and descriptive. These research designs can be useful to arrange a social research or academic research (Gummerson. 2010; Ivankova and Plano Clark, 2018). The research design can be selected on the basis of research objectives and research mottos. The psychological aspects of the

exploratory method can be taken into account. The data always come without any positive or negative judgment outcomes in an explanatory theory in accordance with the explanation of the researchers. Both of the methods whether its exploratory or analytical can be implemented only when the fellow researchers have some set of queries [regarding the research without answers] due to the lack of knowledge of the research objects (Brien and McAllister, 2016; Lesko. 2009). In the year 2009, VanderStoep stated that those researches which have the collection of questions and objectives, both descriptive designs will be useful for those researches (Kothari. 2008). As the descriptive model contains the details in its report of both favorable as well as the negative perspective of researches in its account.

#### **3.4.3.1 Justification for choosing a descriptive research design**

This dissertation contains a set of objectives and aims which indicate which descriptive design has the eligibility to achieving success in the formal researches and the structural creation of the research (Gummerson. 2010; Melendez-Torres, Bonell and Thomas, 2015). To enhance the purpose of the study and to collect the relevant information, the descriptive design analysis has always been helpful. The researchers arranged a survey or cross-sectional survey, which is footing up by descriptive research design because of the time limitation (Hyett, Kenny and Dickson-Swift, 2014; Lesko. 2009). The descriptive design helps the researchers with the vast selection of data in a very short span of time, which is the most critical positivity of this design.

#### **3.5 Sampling Method**

The method of taking samples in a research can divide into two types, which is a probability sampling method and non-probability sampling method. While implementing the probability sampling method, researchers have been noticed that the whole population is represented instead

of randomly selected response and on the other hand, the purposive selection method is taken instead of the random selection in non-probability sampling method. For the sake of gathering primary data, researchers implemented the both of the sampling methods in this topic (Frison, Dekimpe, Croux and Maeyer. 2014; Clandinin, 2016; Marshall and Rossman, 2014; Singh, 2015). Fifty customers have been taken for the survey from with this hope that the probability will be emphasizing the sampling of the massive population on an unbiased management, which will be helpful to understand the cost of the product and time in an effective manner (Harrison and Reilly. 2011; Marshall and Rossman, 2014). The fixed sample has been implemented over four managers to understand the convenient sampling technique (non-probability sampling method) of collecting information using the interview. To collect the enriched and refined data, the researchers need to approach at the convenience of the respondents.

### **3.6 Research strategy**

The researcher can create a research strategy based on the appropriate research purposes. With the help of a survey and case studies and interviews and experiments, a good research strategy can create (Frison, Dekimpe, Croux and Maeyer. 2014; Munn et al., 2014). Data collection in a cost-effective way from a massive number of the community can take place with the help of surveys. Apart from that, in accordance with findings by Brannen (2019), for a researcher, the case studies are the secondary recognition. By conducting or taking interviews of knowledgeable people, the eligible data can get collected. For providing new models and theories which is needful for the research of the topic the experiments can be used to validate with the previous researches (Barnham, 2015; Harrison and Reilly. 2011).

#### **3.6.1 Justification for selection of research strategy (survey and interviews)**

To implement more information and data into the study, amongst the research strategies opted by the researcher include the survey which are very helpful to collect the large amount of data from the population relevant to this study. Apart from these, interviews is another most convenient way to collect data which is rich in detailed information from a limited sample size (Harvey. 2010; Munn et al., 2014).

### **3.6 Data collection methods**

The researcher implements two types of research strategy to collect data and the types are the primary data collection method and secondary data collection method (Joshi and Pant. 2015; Barnham, 2015).

#### **Primary research**

In primary research method, the collection of data have been taken place from those knowledgeable people who already have an idea about the object and after that for data accumulation, a survey was arranged (Knox, 2008).

##### **3.6.2.1 Quantitative data collection method**

With the help of Quantitative data collection method, the creation of a chart or a table or graphs can take place as this method helps to collect the data in the numeric form (Joshi and Pant. 2015). This data collection method helps to collect data in a short span of time from a vast number of the population, which is very helpful for the researcher and the collected data can get authenticated also as it is another quality of this method because it is the subject to testing. The researchers distribute the survey queries and questions through online in quantitative data collection method (Lashgarian and Boushehri. 2014).

### **3.6.2.2 Qualitative data collection method**

In this method, the quality of the collected relevant data gets the importance than the number of the data collection. With the help of qualitative data collection method, it can judge that what is the number of the quality enrichment in a data which have collected on the basis of perceptions and personal experiences (Hyett, Kenny and Dickson-Swift, 2014; Mau, Schramm-Klein and Reisch. 2014). The researcher can go through the facial expression and the respondents with the help of qualitative data collection method.

### **3.7 Accessibility issues**

There are some accessibility issues can occur at the time of the arrangement of the interviews. Such as the unavailability of the fellow managers and this is the big reason for which there was an inability of conducting confronting round of interview by the researchers and as a result, the manager's facial expression remains unknown for the researchers (Mau, Schramm-Klein and Reisch. 2014; Singh, 2015).

### **3.8 Ethical Consideration**

Following some ethical consideration is always important in the process of the research. The researchers always make sure that the respondents should not feel any pressure to take part or continue in the research in accordance with Data Protection act of 1998 and they have the full right to left from the survey at any point of the time (Marshall and Rossman, 2014; Ness. 2009). Apart from the academic purpose, the researchers cannot implement the data for any other purposes. Any type of question which is not related to the subject or can hurt the respondent in emotional level cannot be asked to the respondents by the researchers and even they are not even eligible also to ask in accordance with the data protection act (Nelder. 2011).

### **3.9 Data Analysis**

To analyse the data by saving the cost of time the researcher translated the collected data from various levels of sources into percentages and calculated them into numeric digits. For better understanding and convenient for the readers, the researcher converted those digits into graphs or table forms or chart forms (Clandinin, 2016; Jorgensen, 2015; Papathomas, Kourtzi, and Welchman. 2010). The last but not the least step of data analysis is the converted digits are taken to study by the researcher to go into the depth of the research of those data which had been collected during the interview of the population.



### 3.10 Timetable

Table 1: Time schedule for the research

Main activities and stages	Week 1	Week 2 to 9	Week 9 to 15	Week 15 to 20	Week 20 to 23	Week 23 to 25	Week 26
Selection of the topic	➤						
Collection of data	➤						
Planning the proper layout		➤	➤				
Reviewing literature			➤				
Development of the research plan			➤				
Selecting a research technique			➤	➤	➤		
Gathering Primary data				➤	➤		
Data analysis					➤	➤	
Interpretation of findings						➤	
Conclusion preparation						➤	
Project rough overdraft							➤
Final submission							➤

### 3.11 Summary

The researcher collects the data by following the selected data collection method in this research to reach the goal of the research. While doing this, the researcher has ensured to follow the primary and the secondary research methods as per the requirement to reach the truth after translating those collected data from personal experience or other identified ways and translate them into identifiable form such as graphs or charts or in tables.

## **Chapter 4: Data Analysis and Discussion**

### **4.1 Data Analysis**

To collect a substantial amount of information related to the topic and to assess the manner in which the youth population in Japan perceive the concept of Society 5.0, twelve questionnaires have been developed by the researcher which had been distributed to 65 University level students over the internet in the form of an online survey. The questions in the survey had been kept close-ended to ensure the information that would be collected were concise and to the point. Of the 65 University level students the survey questionnaire had been sent to, 10 had been unavailable due to studies or other reasons. However, the information that had been gathered from 55 participants was adequate and substantial in terms of carrying on with the future steps of the research. The data has been presented in this chapter in the form of graphs and tables. The response percentages have then been calculated and analysed in order to understand the perception of the targeted population for the topic in discussion.

#### **Survey Questionnaire for 50 University Level Students**

##### **1. To what extent do you agree that the concept of Society 5.0 is practically applicable?**

The respondents were asked to share their response 'To what extent do you agree that the concept of Society 5.0 is practically applicable'. As per the responses received (see table 2), a total of 46% respondents (N = 23) strongly agreed to the fact that the concept of society 5.0 is practically applicable in the context of Japan whereas only 26% respondents (N = 13) agreed. A point to note is that 4% respondents remained neutral. On the other hand, about 14% respondents disagreed that the concept of Society 5.0 is not really practically applicable in the context of a nation with 10% sharing strong disagreement.

Table 2: Responses on the practical application of Society 5.0

Response	Response Frequency	Response Percentage	Number of Respondents
Strongly Agree	23	46%	50
Agree	13	26%	50
Neutral	2	4%	50
Disagree	7	14%	50
Strongly Disagree	5	10%	50

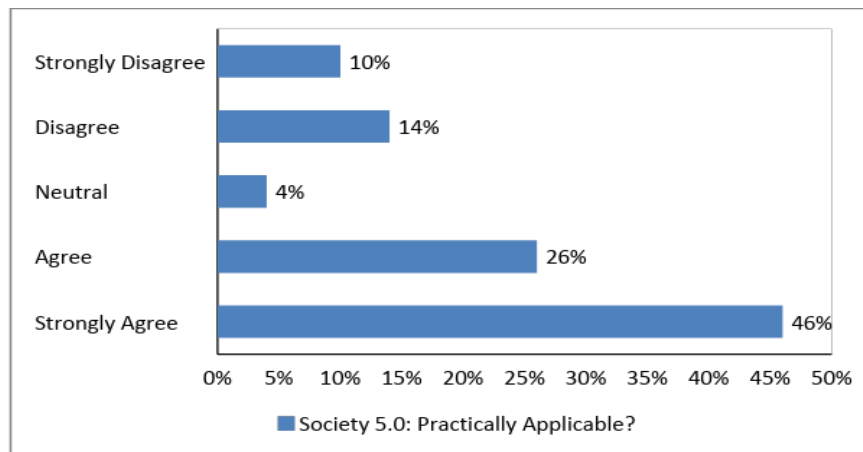


Figure 2: Responses on the practical application of Society 5.0

## 2. To what extent do you agree that Society 5.0 would benefit the nation?

Respondents were asked if they agree that Society 5.0 would benefit the nation. About 70% spoke in favour to the fact that Japan would benefit from it as may bring about immense changes and developments in the context of Japan. Apart of these 70%, 36% (N=18) were in strong agreement. However, there were 6% (N=3) of the respondents who believed that society 5.0 would not be that beneficial for Japan. The main reason could be behind it is that they did not know much about the basic concepts and the aims that the Japanese government desires to achieve with the implementation of the society 5.0 concepts. On one hand, almost 8% (N=4) of the respondents disagreed to the question which suggests that these respondents do not believe

that the implementation of the Society 5.0 is going to be useful for the Japanese society. About 10% of the respondents have strongly disagreed suggesting that these respondents do not find any practical implication for Society 5.0 in the context of Japan.

Table 3: Responses towards benefit of society 5.0 to the country

Response	Response Frequency	Response Percentage	Number of Respondents
Strongly Agree	18	36%	50
Agree	20	40%	50
Neutral	3	6%	50
Disagree	4	8%	50
Strongly Disagree	5	10%	50

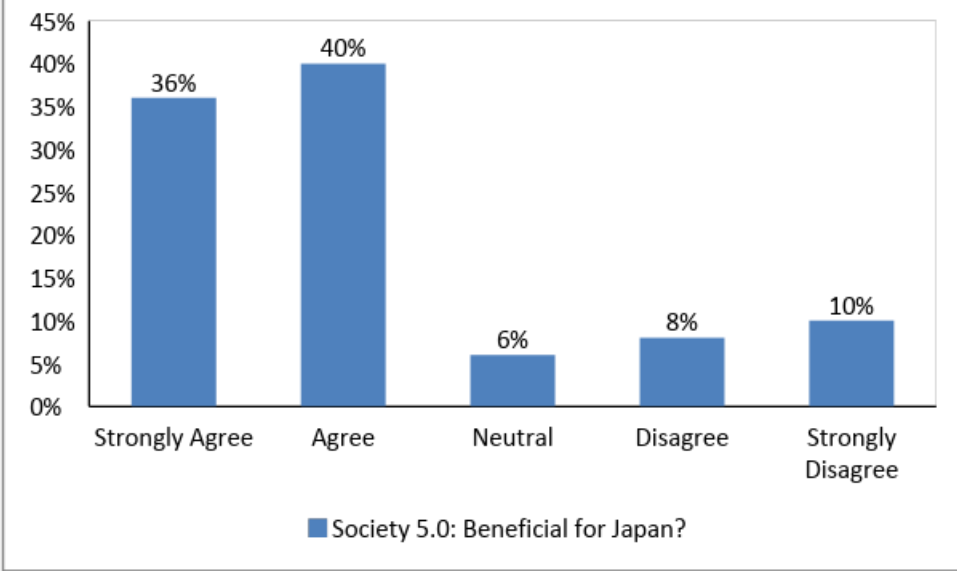


Figure 3: Responses towards benefit of society 5.0 to the country

**3. What would be the main benefit if Society 5.0 is implemented?**

The respondents segment were asked about the benefits that Japan could derive from the implementation of Society 5.0. Almost all of the respondents believed that there will be several developments to the society which would be brought about by the implementation of Society 5.0. About 26% of the total respondents have suggested that with the successful implementation of

the conceptual Society 5.0, immense advancements would be brought to the technological fields and the technologies in the country would undergo robust implementation. About 30% of the respondents have suggested that the implementation of the Society 5.0 would enable the private, public and individual institutions in the country in terms of delivering more efficient and stable services through the development of automated systems and robots. The public, as well as, private transportation networks are going to experience intense positive changes as suggested by almost 18% of the total respondents. About 16% of the total respondents believed that the development of the futuristic environment with the implementation of Society 5.0 would enable the government and private entities in terms of resolving the social issues. However, it has been observed that almost 10% of the respondents were not much aware of the basic concepts and implications of the Society 5.0 due to which they have remained neutral and did not provide any specific answers.

*Table 4: Responses towards the main benefits of implementing society 5.0*

<b>Response</b>	<b>Response Frequency</b>	<b>Response Percentage</b>	<b>Number of Respondents</b>
<b>Robust implementation of technology</b>	13	26%	50
<b>Provision of improved services through automated systems and robots</b>	15	30%	50
<b>Incorporation of Artificial Intelligence in public and private transport networks</b>	9	18%	50
<b>Development of a more futuristic environment based on resolving social issues</b>	8	16%	50
<b>Neutral</b>	5	10%	50

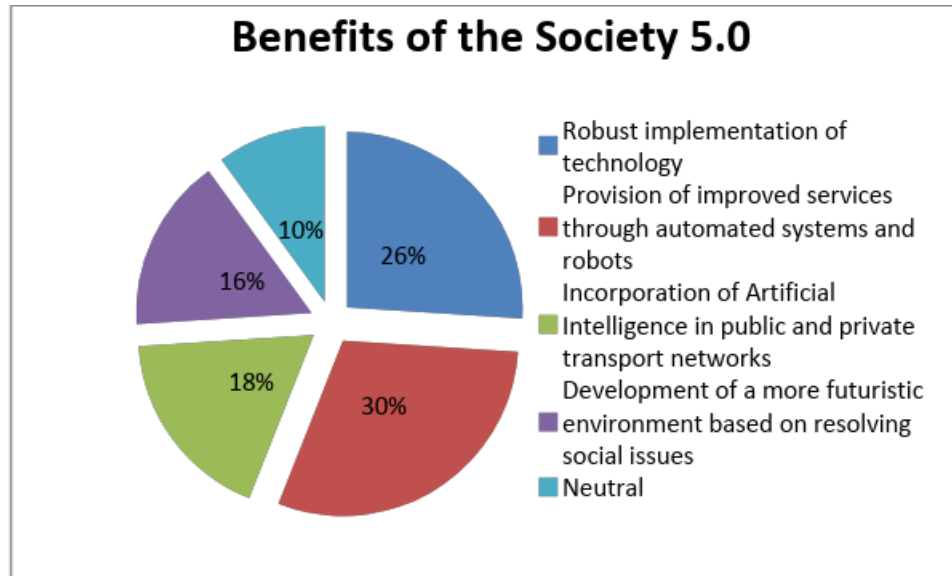


Figure 4: Responses towards the main benefits of implementing society 5.0

#### 4. What would be the practical implication of Society 5.0 in the context of Mobility?

The question highlights what are the practical implementation of Society 5.0 in the context of mobility. A majority of the respondents agreed that in the context of mobility, the concept of society 5.0 is practically applicable.

Table 5: Responses towards practical implication of Society 5.0 in the context of Mobility

Response	Response Frequency	Response Percentage	Number of Respondents
Making travel and sightseeing easier	15	30%	50
Making movement enjoyable without congestion	8	16%	50
Combining the car services and public transportation	14	28%	50
Introduction of self-driving wheelchairs for elderly and physically disabled individuals	13	26%	50

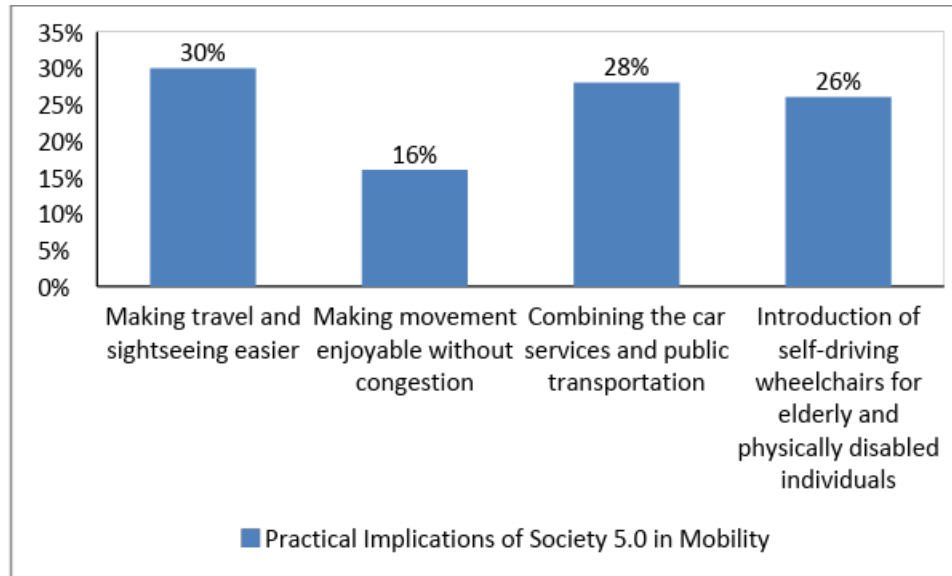


Figure 5: Responses towards practical implication of Society 5.0 in the context of Mobility

Almost 30% (N=15) of the respondents said that the implications of the Society 5.0 is oriented around making travelling and sightseeing much easier. Other than this, 16% of the respondents (N=8) said that the overall mobility in the context of Japan could become less congested which would make movement enjoyable for the passengers. 28% of the respondents agreed that practical implications of the concept of Society 5.0 may also include the development of collaboration among the car services and transportation which would improve the mobility greatly in the country. On the other hand, almost 26% of the respondents have suggested that the implementation of the Society 5.0 would enable the elderly and physically disabled individuals to move freely with the help of the self-driving wheelchairs.

### **5. What would be the practical implication of Society 5.0 in the context of Healthcare and Caregiving?**

The respondents were asked the question about what they believe are the practical implications of Society 5.0 in the context of Healthcare and Caregiving, it was observed that almost all of the respondents agreed to the fact that there are many practical implications of the Society 5.0 in the

context of health care and caregiving. About 34% (N=17) of the respondents have suggested that in the field of healthcare and caregiving, introduction of robots may provide life support to the individuals in need and may furthermore act as communication partners. It has been suggested by almost 26% (N=13) of the respondents that through the implementation of Society 5.0, it would be possible to promote healthy living among the citizens of the nation. It would also allow early detection of diseases which would improve the overall health care and caregiving framework. Through the facilitated collection of psychological and medical data, the optimal provision of treatment would also be possible as suggested by almost 16% (N=8) of the respondents. Equally, about 24% (N=12) of the respondents, on the other hand, have suggested that the healthcare and caregiving in the context of Japan would benefit through the provision of on-site care through robots.

*Table 6: Responses towards practical implication of Society 5.0 in the context of Healthcare and Caregiving*

<b>Response</b>	<b>Response Frequency</b>	<b>Response Percentage</b>	<b>Number of Respondents</b>
<b>Introduction of robots to provide living support and communication enablers</b>	17	34%	50
<b>Promoting healthy life and early detection of diseases</b>	13	26%	50
<b>Optimal provision of treatment through psychological and medical data</b>	8	16%	50
<b>Provision of on-site care through robots</b>	12	24%	50



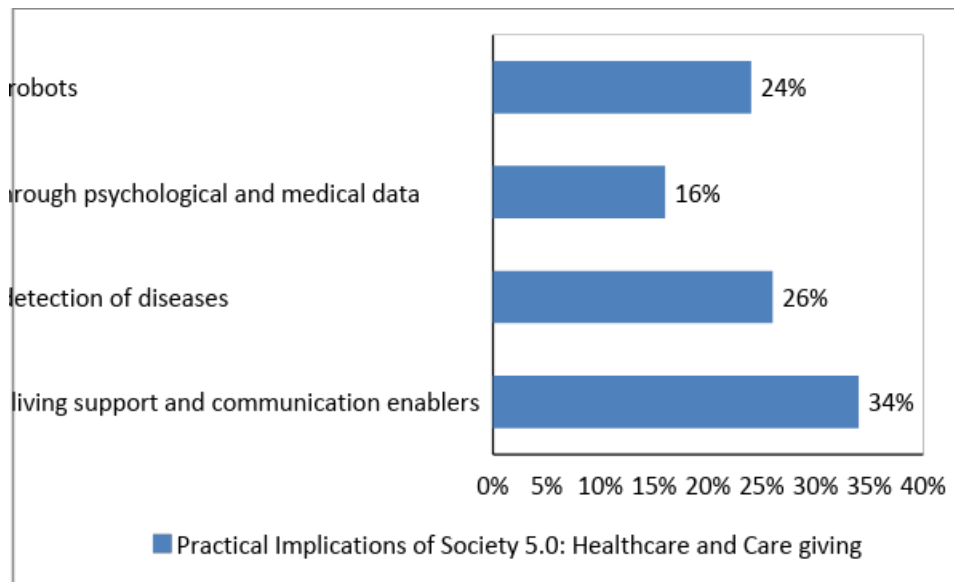


Figure 6: Responses towards practical implication of Society 5.0 in the context of Healthcare and Caregiving

## 6. What would be the practical implication of Society 5.0 in the context of agriculture?

The next question asked the respondents to share their views on the practical implementation of Society 5.0 in context of crop yield or agricultural availability in Japan. From the analysis, it has been observed that almost all of the respondents agreed to the fact that practical implications of the concept of Society 5.0 in the context of Agriculture in Japan are quite many. About 36% (N=18) of the respondents have suggested that with the implementation of Society 5.0 in this context would allow the firms, farmers and scientists in identifying the crop yields which would facilitate meeting the demand of the agricultural products for the concerned parties. On the other hand, as suggested by 38% (N=19) of the respondents, the availability of the agricultural products would almost increase as a result of the implementation of the Society 5.0. Simultaneously, about 26% (N=13) of the respondents have suggested that the introduction of self-driving vehicles to deliver agricultural products to the consumers would bring a number of benefits in the context of the agriculture industry.

Table 7: Responses towards practical implication of Society 5.0 in the context of agriculture

Response	Response Frequency	Response Percentage	Number of Respondents
Identification of crop yields to meet demand	18	36%	50
The increment of the availability of the agricultural products	19	38%	50
Introduction of self-driving vehicles to deliver agricultural products	13	26%	50

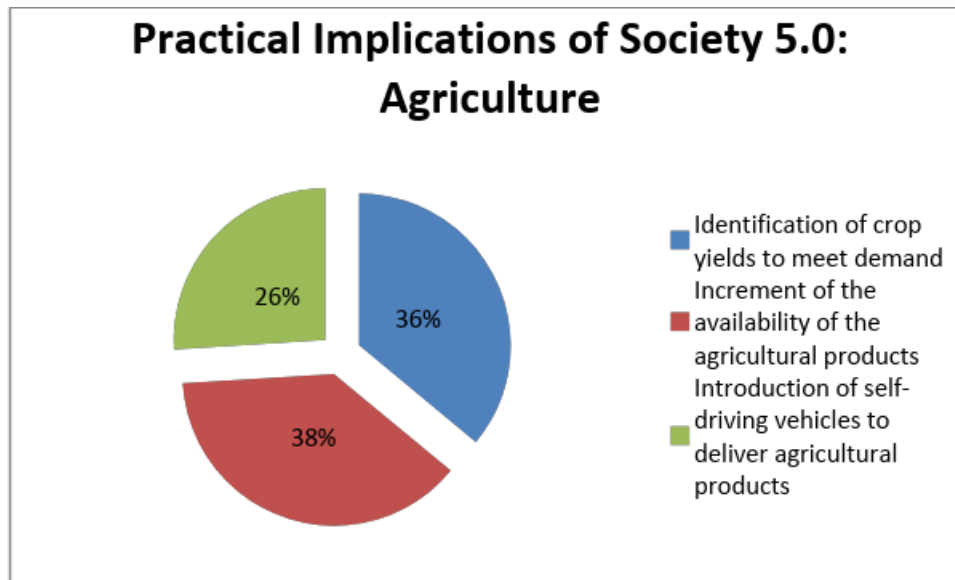


Figure 7: Responses towards practical implication of Society 5.0 in the context of agriculture

**7. In what ways the implementation of Society 5.0 would benefit the disaster prevention and the energy saving capacities of Japan?**

When asked to the respondents that in what ways implementation of Society 5.0 would benefit the disaster prevention and the energy saving capacities of Japan, 26% (N=13) of the respondents think that with the implementation of the Society 5.0, the provision of information pertaining to the shelter and relief centres in times of crises would be facilitated.

Table 8: Responses towards ways the implementation of Society 5.0 would benefit the disaster prevention and the energy saving capacities of Japan

Response	Response Frequency	Response Percentage	Number of Respondents
Easier access to information about shelter and relief in times of crises	13	26%	50
The introduction of victim discovery systems and rescue robots	20	40%	50
The increment in energy saving by the families	7	14%	50
The increment of the supply of stable energy	10	20%	50

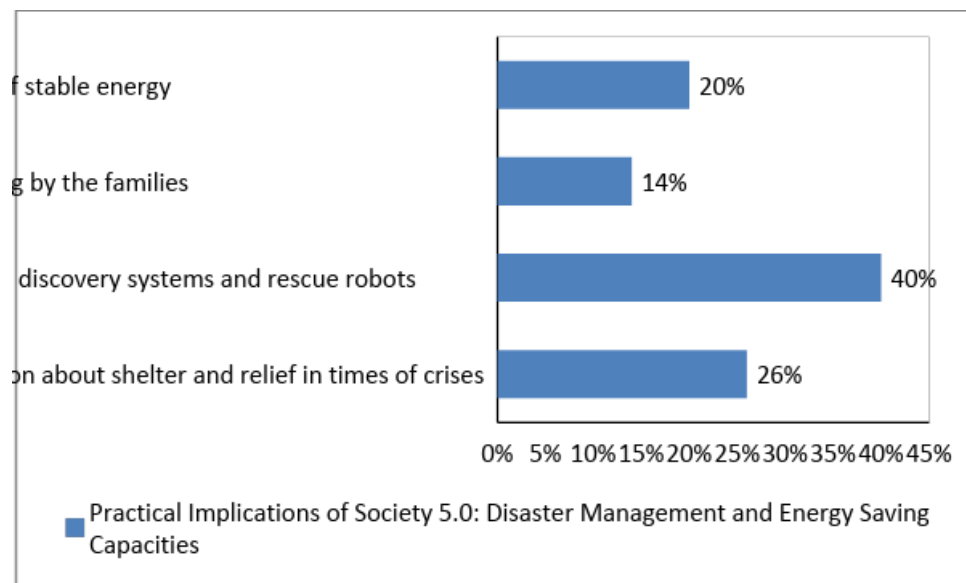


Figure 8: Responses towards ways the implementation of Society 5.0 would benefit the disaster prevention and the energy saving capacities of Japan

Almost 40% (N=20) of the respondents suggested that the introduction of victim discovery systems and rescue robots would reduce the complications for the government and other entities by providing shelter and relief services to the country in the times of emergencies. Through the implementation of society 5.0, the energy saving by the Japanese families would increase as suggested by 14% (N=7) of the respondents. On the other hand, about 20% (N=10) have suggested that the implementation of the Society 5.0 would increase the supply of stable energy.

## 8. What components do you think are needed to achieve a Smart Services Society?

The question was asked in order to understand the perception of the youth generation with regards to the components and enables of Smart Services Society.

Table 9: Responses towards components needed to achieve a Smart Services Society

Response	Response Frequency	Response Percentage	Number of Respondents
Enhancement of the quality of life	12	24%	50
Enhancement of the interaction between machines and the humans	5	10%	50
Development of the ICT framework	19	38%	50
Enhancement of Lifestyles of the users	14	28%	50

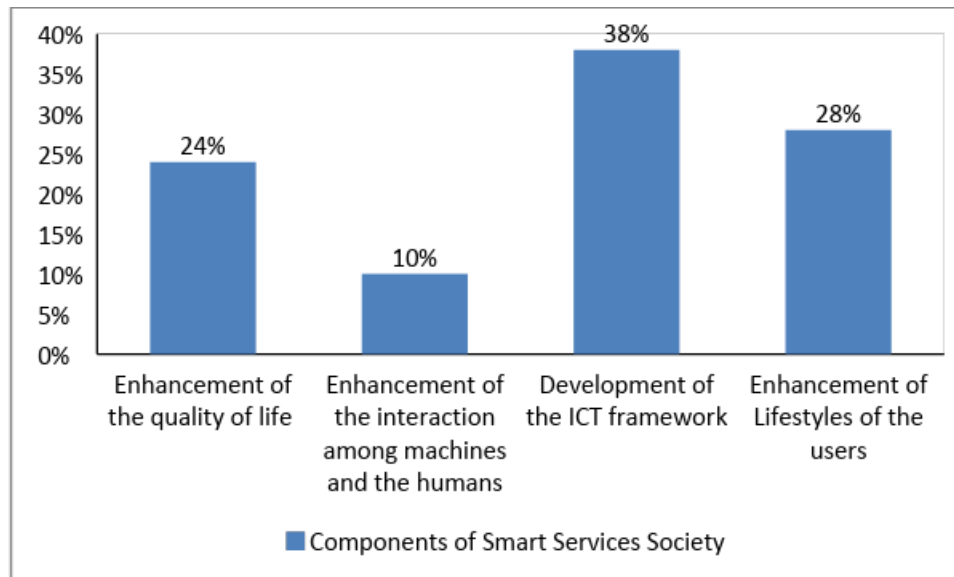


Figure 9: Responses towards components needed to achieve a Smart Services Society

When asked this question, about 24% (N=12) of the respondents stated that the basic component of Smart Services Society should be the enhancement of the quality of life. About 10% (N=5) of the total respondents have suggested the increased amount of interaction between the machines and the humans should be an integrated component of Smart Services Society. While 38% (N=19) of the respondents have suggested that the basic component of Smart Services Society

should be the development of the ICT frameworks. About 28% (N=14) of the participants have suggested that the enhancement of the lifestyles of the users should be the key component of the Smart Services Society.

**9. What, according to you, are the main concerns associated with the implementation of Society 5.0?**

The question asked to the participants to find out the main concerns associated with the development of Society 5.0. It has been analysed that 34% (N=17) of the participants agreed that the development of technology without gathering sufficient user opinions may be a concern in the context of the Society 5.0. About 14% (N=7) of the respondents were concerned about the existence of multiple stakeholders. About 20% (N=10) of the respondents have suggested that with the implementation of Society 5.0, the rate of unemployment may increase significantly while the remaining 32% (N=16) of the participants, have expressed their fear for autonomy.

*Table 10: Responses towards main concerns associated with the implementation of Society 5.0*

<b>Response</b>	<b>Response Frequency</b>	<b>Response Percentage</b>	<b>Number of Respondents</b>
<b>Development of technology without gathering user opinions</b>	17	34%	50
<b>The existence of multiple stakeholders</b>	7	14%	50
<b>Increased rate of unemployment</b>	10	20%	50
<b>Fear for Autonomy</b>	16	32%	50

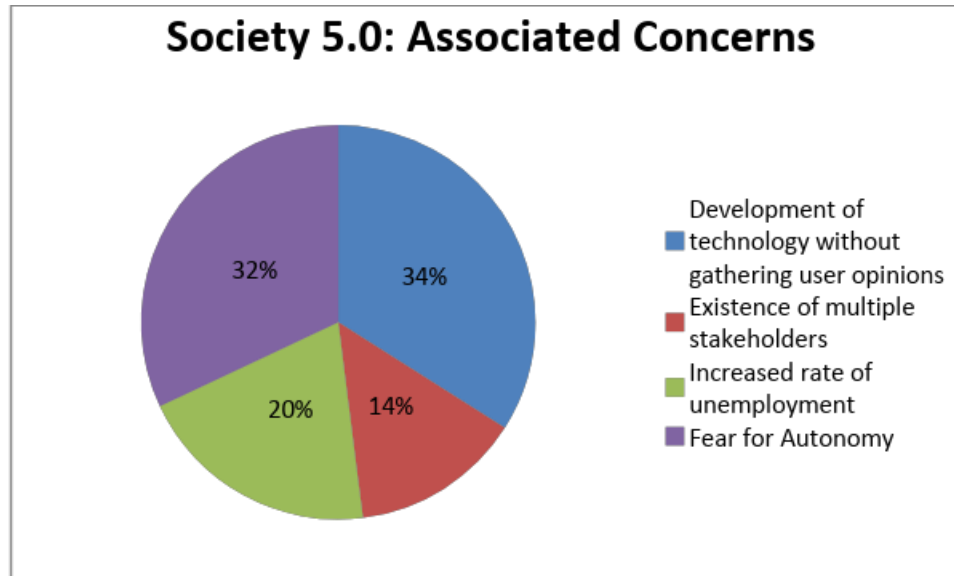


Figure 10: Responses towards main concerns associated with the implementation of Society 5.0

#### 10. In which ways do you think Society 5.0 would function?

The respondents in this section were asked about their thought or point of view on the ways in which Society 5.0 would function, and from the presented information, it may be observed that almost 16% (N=8) of the respondents believed that the manufacturing industry would experience a massive evolution due to the implementation of Society 5.0. While, 24% (N=12) of the respondents have suggested that the mobility context of Japan would experience immense improvements such as the development of connected cars and automated driving networks. About 18% (N=9) of the respondents suggested that the health management would improve immensely with the provision of wearable devices with this new system implementation. The financial technologies that are being used recently by different firms and organisations are going to experience positive change with the implementation of the Society 5.0 as suggested by almost 10% (N=5) of the respondents. About 16% (N=8) of the respondents, on the other hand, have suggested that the regulations associated with systems would be strengthened through the implementation of Society 5.0. 16% (N=8) of the respondents have suggested that the

implementation of Society 5.0 would bring positive changes in terms of disaster management and energy efficiency.

Table 11: Responses towards ways Society 5.0 would function

Response	Response Frequency	Response Percentage	Number of Respondents
Evolution of the manufacturing industry	8	16%	50
Connected cars and automated drivings	12	24%	50
Health management by wearable devices	9	18%	50
Financial Technology	5	10%	50
Strengthening of the System Regulations	8	16%	50
Improved disaster management and energy efficiency	8	16%	50

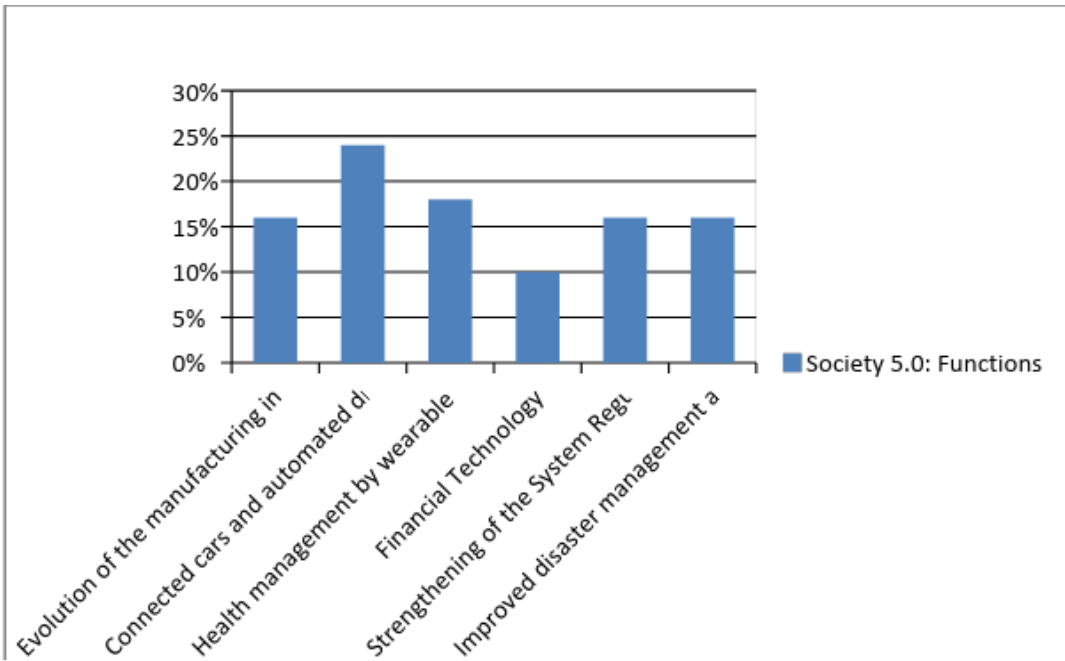


Figure 11: Responses towards ways Society 5.0 would function

### 4.2 Discussion

The information that has been gathered pertaining to the project clarifies the manners in which the different practical applications and implications of the concept of Society 5.0 are perceived

by the youth population of Japan. From the analysis of the information, it has been identified that a majority of the population thinks that the implementation of the Society 5.0 will bring about an immense number of advancements in the context of Japan. With the implementation of the Society 5.0, massive positive changes are going to be notable in the context of technological advancements. The main sectors which will benefit from the implementation of the Society 5.0 include the mobility and transportation sector, the manufacturing industries, the financial organisations, the healthcare and caregiving organisations, the cyberspace, the disaster management and energy saving organisations and the agricultural organisations. In the context of mobility, it may be stated that with the implementation of the Society 5.0, it would be possible for the vehicle and transportation networks to integrate their systems and develop a guiding interface for the passengers and drivers which make their journeys enjoyable by reducing the congestion on roads. The introduction of early disease identification systems and robots would bring robust improvements in the context of the healthcare and caregiving as these to enable such service providers in terms of mitigating the health risks of the population and provide 24 hours with a daycare to the individuals in need. The disaster management and energy saving aspects would also be facilitated as a result of the implementation of the Society 5.0. With the development of automated systems, it would be easier for shelter and relief providers to discover the individuals that fall victim to emergencies such as flood or earthquakes. The introduction of rescue robots would decrease the risks associated with rescuing the victims. Furthermore, the agricultural industry will benefit as with the automated systems and technologies, it would be possible to analyse the crop yield to meet the demands. In the context of the financial industries, it would be easier to access and analyse data whenever needed with the help of the automated financial systems. The cyberspace, on the other hand, is expected to undergo massive positive



changes such as the enforcement of more secure and safe networks which would increase the safety of private information and mitigate cybercrime. Through the development of the ICT frameworks, it may also be possible to mitigate terrorism in the context of the cyberspace. There are some concerns that remain in the context of the implementation of Society 5.0. For instance, when developing new technologies, the only perspective that is taken into account is the technological perspective which limits the ability of the organisations in terms of evaluating the perceptions of the users. Furthermore, the existence of multiple stakeholders may limit the extent to which the Society 5.0 may reach in the context of Japan. Furthermore, the increment of the technological advancements which will be adopted by nationwide organisations with the implementation of the Society 5.0, may increase the unemployment rate in the country given that the machines are more fast, accurate and reliable than the human employees.

## Chapter 5: Conclusion

On the front of bringing advancements to Japan, there are many interferences that have to be taken by the government with the country facing specific challenges to its approach to digitalization of its society. Currently, to live the life happily and in the full form, reaching out the society 5.0 is the new goal through the development of technological perspective and economic growth necessary for a large number of the population (and not for few people). In the Japanese industry, various activities have been initiated after the disclosure of this society 5.0 concept, especially in academic front. The initiative is not for the development of a single country, but to bring about positive outcomes globally. This implies that the whole world will benefit from society 5.0 allowing it to overcome the development challenges of society with due consideration of technical challenges and its effect on the economic status of a country.

The aim of this research is optimization and verification of the extent of Society 5.0 can work in the service of human and the elderly, balancing economic progress and solving social problems through the integration of Cyberspace and Physical Space (CPS).

The research examined the various factors that drive the implementation of society 5.0 and evaluated the practical application of society 5.0 implementation and the benefits it offers to the country's economy. It also examined how society 5.0 support mobility, healthcare & caregiving, agriculture, and disaster prevention sectors thereby leading to a smart services society. The key findings include:

- The concept of society 5.0 has a great potential in supporting the growth and development of a country and its economy through the development of smart services society.

- The main benefits of society 5.0 implementation were noted in the form of improved automation in systems and robots, and robust technology integration across diverse industries.
- In the mobility sectors, society 5.0 was noted to improve transportation primarily in the public sector, easing congestion and assisting the disabled and elderly in their transportation requirements.
- In the healthcare sector, society 5.0 was noted to boom through the integration of robotic technology and communication enablers, along with assistance in early detection and prevention of ailments.
- In the agricultural sector, it was found that society 5.0 can bridge the gap between supply and demand, and boost availability of agricultural products.

It is found that 2.0 p have given a positive impact on society in various aspects. Such as Government 2.0, Smart cities, industry 2.0, artificial intelligence 2.0, and smart societies. The new IT-based innovation which is 2.0 p, it is entirely human-centred and socially oriented as it has gained great potential values to create management industry in a new form, societies, cities and the government in recent years. To spread the user end mobile devices in a broader perspective in a smart society management, the intelligent sources are beneficial in this perspective. The technology based social computing which includes the big data. IoEs and mobile internet starting from the access and usages of resources which are sourced from CPSS and from the management system of social innovation which also has been stimulated like the virtual real interaction and mobile visualization and real time feedback. The new IT helps in formation of robotics, artificial intelligences, smart societies and virtual reality technologies

which significantly shows or indicate the society management structure transformation and this procedure takes place from the unbalanced information, the way of centralization and the unequal interaction towards the fair information, the fair fights, air interfaces and the fair information and the core way of getting the overcome from the problems are overcome from the significant gaps which are lying in between the modelled behaviour and the actual behaviour. By utilizing the law of Merton, many perspectives of society can be assumed. Such as the future state of the society, the flexible and realize, covered and focused the smart cities management. The exchange trading system and the autonomous stock trading system is terrible as the limitation of that order has been already taken place and via tweeting in all over the world and weather information collection and reading newspapers and public documents and the documents of corporations of government therefore analyse them and then need to decide the exchanges or buying or selling the stocks or the other financial instruments.

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