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# Society 5.0, Its Logic and Its Construction

The main theme of this book is the description of society and of everything which surrounds it, that is to say, what has been defined as the fifth societal wave.

## 1.1. The origins of society 5.0

The term "society 5.0" first appeared in Japan in 2016. Since then, it has been spreading and its underlying concepts continue to be shaped.

Society 5.0 is a term used in the *Fifth Science and Technology Basic Plan*, reviewed by the Japanese Government's Council for Science, Technology, and Innovation. It was enforced by the Japanese Cabinet of Ministers in January 2016.

DEFINITION. "Society 5.0" can be defined as a "society of intelligence", in which physical space and cyberspace are strongly integrated.

Society 5.0 emerged from the hunter-gatherer society, the agricultural society, the industrial society and the information society. Although focused on humanity, 5.0 refers to a new type of society where innovation in science and technology occupies a prominent place, with the aim of balancing social and societal issues that need to be solved, while ensuring economic development. Although it borrows many of its elements, this approach is opposed to that of the proponents of decline.

The Japanese have introduced society 5.0, by illustrating it with Figure 1.1.
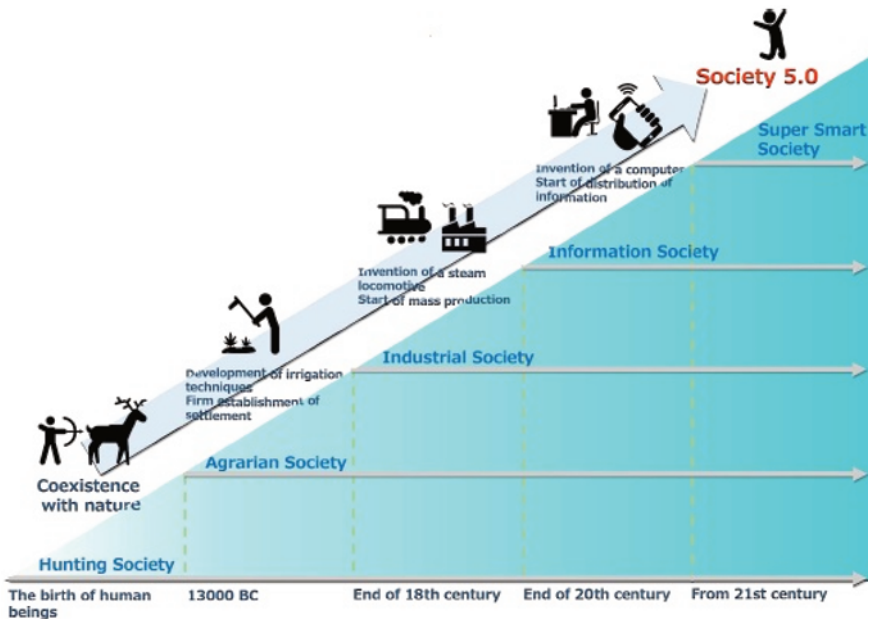


**Figure 1.1.** *Definition of society 5.0. For a color version of the figure, see www.iste.co.uk/salgues/society.zip*

The "basic plan for science and technology" is a comprehensive plan for the promotion of science and technology, decided by the Japanese Government and incorporated into a fundamental law, which will be positioned in the next decade, in the same way as the European H2020 bid solicitations. The fifth basic plan (2017–2021) is the first one for Japanese governments. This law establishes a Council for Science, Technology, and Innovation (CSTI). Thanks to an array of different measures, it strongly favors innovation policies for science and technology. The plan has been brought forward as a model for a wide range of stakeholders, including government, the university environment, the industry and citizens, so as to

co-build the society of tomorrow. It also aims to guide Japan so that it can become "the most favorable country for innovation".

This plan is sharply different from the innovative strategic axes proposed by the French Minister of Economy, Arnaud Montebourg, and amended by his successor, Emmanuel Macron. In Europe, countries have defined industrialization axes in general, and this was certainly the case in France. The Ministry for Productive Recovery in office in those times translated the priorities of the French industrial policy into 34 plans, which were designed for coordinating the actions of public actors and companies. The announced aim was to favor the emergence of the products of the future under the label "Made in France".

- Big Data

- Cloud computing

- Connected objects

- Augmented reality

- Embedded software and embedded systems

- Contactless services

- E-education

- Digital Hospitals

- Cybersecurity

- Nanoelectronics

- Robotics

- Supercomputers

- Innovation in the food industry

- TGV of the future

- Two liters per 100 km vehicle for all

- Autopilot vehicles

- Electric recharging terminals

- Battery autonomy and power

– Electric planes and a new generation of aircrafts

– Electrically propelled satellites

– Heavy load airships

– Ecological ships

– Renewable energies

– Smart electrical networks

– Water quality and management of scarcity

– Medical biotechnologies

– Innovative medical devices

– Telecommunications sovereignty

– Wood industry

– Recycling and green materials

– Thermal renovation of buildings

– Green chemistry and biofuel

– Technical and intelligent textiles

– Factory of the future

**Box 1.1.** *The initial 34 industrial plans*

When his successor, Emmanuel Macron, took office, he reduced Montebourg's industrial plans from 34 to 10. The plan was associated with goals. These 10 plans were broken down into 9 specific plans, and 1 particular and transversal plan called "*Usine du future*" ("Factory of the future"). This approach was considered more important than others. The "Industry of the future" approach sought to develop a technological offer, by accompanying the transformation of companies, training employees, and with a strong emphasis on international cooperation.

| Plan | Contents | Goals |
|------|----------|-------|
| New resources | Biosource and recycled materials | 2020: to double the volume of raw material of vegetal origin in the French chemical industry, increase nondangerous waste recycling by 50% |
| Sustainable city | Water, smart grid, thermal renovation, wood industry | 2020: 100 billion euros turnover and more than 110,000 territorialized jobs |
| Ecological mobility | 2 L/100 vehicle, charging station, autonomous vehicle, energy storage | 2016: 20,000 recharge stations[1]<br>2020: 30% decrease in $CO_2$ emissions of new vehicles manufactured in France |
| Transport of the future | TGV, ecological ships, electric planes, electric airships and drones | 2020: to sell 80 electrically run school-planes, undated 50% decrease in energy consumption of buildings |
| Medicine of the future | Digital health, medical biotechnologies, medical devices | 2017: 50,000 patients with a chronic disease under medical remote monitoring[2]<br>2025: to reestablish the French trade balance in terms of medical technology, whose current deficit is equivalent to 1 billion euros |
| Data economy | Big Data, supercomputer, Cloud Computing | 2020: to create and consolidate 137,000 jobs thanks to Big Data, to master the critical technology of exascale supercomputers, which make it possible to perform 1 billion operations per second |
| Intelligent objects | Connected objects, robotics, augmented reality, contactless services, innovative textiles | 2020: 8 million customers using mobile payment methods, to deploy an interoperable ticketing app to be used in 50% of cities with more than 200,000 inhabitants |

1 According to data provided by the roaming consortium for electric mobility recharge GIREVE (*Groupement pour l'itinérance des recharges électriques de véhicules*), by the end of 2016, in France, there were 15,883 public parking places for recharging electric vehicles, disseminated in 5,297 stations. For more information: http://www.gireve.com.

2 If we only take heart failure into account, 350,000 pacemakers and 60,000 connectable automatic defibrillators are implanted in France. However, only 40,000 of these devices can be activated by a remote monitoring system.

| Plan | Contents | Goals |
|---|---|---|
| Digital trust | Cybersecurity, telecommunications sovereignty, nanoelectronics, embedded systems, embedded software, electrically powered spacecraft propulsion | 2020: to develop 5G infrastructure per mile, annual growth of 30% in the cybersecurity export market share, half of all sales in electric satellites |
| Intelligent food | Functional food, packaging of the future, lasting cold and food security | 2017: modernization of 30% of industrial slaughterhouses and recruitment of 90,000 people for the sector |

**Table 1.1.** *Emmanuel Macron's nine specific plans*

## 1.2. The ancient ages

Society 5.0 can be defined by its uses and by its societal leading elements.

After the 18th Century and the birth of the industrial revolution, innovations followed one another.

1771: the beginning of the Industrial Revolution with the appearance of machines, factories and canals.

1829: steam, coal, steel and train became the four predominant development factors.

1875: steel and hard engineering encouraged the birth of new development stars: electricity, chemistry, civil engineering and shipbuilding. Governments sponsored engineering schools in these fields.

1908: the car became complementary to water and railway means of transport. It quickly required oil resources, which led to the emergence of complementary industries, such as petrochemistry and mass production.

1971: the information and communication technology industry fed multiple economic sectors, leading not only to the birth of a semiconductor industry, but more fundamentally to the world of software and applications.

OBSERVATION. Society 5.0 is not defined by these innovation waves, but by the way in which innovations have modeled society. Society 5.0 is based on different pillars, including industry 4.0 and cybernics. It has changed lifestyles with the appearance of city 3.0. This society employs information and communication technologies 2.0 and defines humanity 2.0.

Each of these themes will be discussed in the rest of the book.

## 1.3. Cybernics or cyber-physical systems

DEFINITION. Cybernics is an interdisciplinary field that aims to develop technologies, industries and societies, which can help to support and examine the functions of the human body.

Cybernics includes various fields, such as the development and spread of medical robots and nursing care, engineering, medical sciences, information science and social sciences. These technologies are often designated as "cyber-physics".

Cybernetics was founded by Norbert Wiener at the times of World War II[3].

DEFINITION. Cybernetics is the science of governing or managing information, with the goal of driving systems.

Cybernics is the tool implemented for carrying out cybernetics. Cybernetics relies on:

– the notion of control;

– energy regulation;

– entropy reduction.

Norbert Wiener's approach relies on the notion of feedback, which translates a circular vision of communication. The notion of energy regulation is necessary in order to set up society 5.0. At Yoshiyuki Sankai, cybernics is introduced as a frontier science that combines cybernetics, mechatronics (itself an alliance between mechanics and electronics) and

3 We are referring to Norbert Wiener's book, *Cybernetics, or Control and Communication in the Animal and the Machine*, MIT Press, Boston, 1961.

computing. Its goal is to integrate humans into robotics and the other way around. One example of this could be the Hybrid Assistive Limbs (HAL) exoskeleton. For Kenji Suzuki, it should be praised as a technology which can lead to an augmented man.

## 1.4. The Council on Competitiveness-Nippon (COCN)

In order to increase industrial competitiveness, which is the foundation for the sustainable development of a country, various policies are implemented, particularly in terms of science and technology policies and industrial policies. The roles of the public and private sectors are coordinated by the Competitiveness Council. They issue common policy recommendations regarding the industry, cooperation between different universities, the government, its agencies and other actively related organizations. A group of 38 interested firms, present in various industrialized countries, are currently working in order to encourage and carry out the project.

## 1.5. The lessons of history

The contributions of societies from the past are summarized in Table 1.2.

| Society | Characteristics | Society 5.0 |
|---|---|---|
| 1.0 Hunting and gathering | The need for sustainability | Full use of information and communication technologies |
| 2.0 Agricultural | Inclusion | Citizen-centered (included citizens) |
| 3.0 Industrial | Effectiveness | Participation of everyone (rejection of fractures) |
| 4.0 Information | Power of intelligence (and knowledge) | Shared values: sustainability, inclusion, effectiveness and the power of intelligence |

**Table 1.2.** *Characteristics of society 5.0*

Society 5.0 appears as the will for balance in the search for optimization of the four previous societies.

Society 5.0 seeks to achieve sustainability (ecology), broad inclusion, efficiency, and therefore, the industrial competitiveness of those who implement it using the power of intelligence and knowledge.

## 1.6. The decision variables of society 5.0

It is necessary to raise the question regarding the decision variables of society 5.0.

QUESTION. Are information, distractions, identity, alienation and action other decision variables?

What is interesting in our case is that this questioning leads back to our psychological chain and the notion of boredom. The following chapters will develop these topics.

### 1.6.1. *Which role for information?*

The flagship product of media is information, in fact; it is a pure product that eliminates boredom, because information is interesting. "Information is processed, meaning is interpreted"[4]. The romantic and modern vision has pushed men to integrate collective modes of thought, which quickly seem limited, and generate boredom. These ways of thinking are built by media and advertising. On the other hand, information is not ready to die away, so this causes infobesity.

For Ladwein, information is deployed on two levels: the informational context and that of basic knowledge. The implementation of memory, perceptions and interpretations is at the origin of reasoning, of judgment, and this leads to deliberation, choices, which are then translated into behavior[5]. This fundamental mechanism should not be rejected on the pretext of boredom and the chain "need-desire-expectation-demand".

Marketing experts like Nathalie Joulin have pointed out that consumers are better informed and more autonomous. Consumers are more experienced

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4 Lars Fr. H. Svendsen, *Petite philosophie de l'ennui*, translated from Norwegian by Hervieu H., p. 41, Fayard, Paris, 2003.
5 Richard Ladwein, *Le Comportement du consommateur et de l'acheteur*, 2nd edition, p. 51, Economica, Paris, 2003.

and have been modeled by new technologies, media and traveling. This kind of knowledge has made consumers more independent. For example, we can observe that in the field of health, computers and their software will increasingly replace doctors[6]. This notion of information integration is crucial for society 5.0. We should observe that the notion of information integration into processes and actions is more important than artificial intelligence, as we know it these days.

The other point is the frequent distinction between code-information and signal-information. The so-called "information theory" of the mid-20th Century (Shannon, Wiener) employed the notion of signal-coding at the transmission end. Then, a statistical theory was superimposed on the initial theory. The idea of using Boolean algebra contributed to the notion of computationism. In fact, the concept of computationism went beyond the notion of computation, and gave rise to the fact that coded-information has a double, which is the signal, meaning that we are able to process not only calculations, but also events. Indeed, the latest developments in computer science have stemmed from this. New keywords, such as the Internet of Things (IoT), were born. Events surveyed by these objects will lead to actions.

DEFINITION. Computer science expresses the theoretical and technical possibility of manipulating signals, which correspond to numerical symbols, and can thus perform calculations.

DEFINITION. A computer is a set of signals managed by algorithms, with a pre-established purpose.

The information code generally has cognitive content, or meaning, and this is regardless of the type of media employed. The term "cognitive share of information" is also used. The signal information is an indication, or a stimulus. In this case, the corresponding notion can be represented by a concept.

The informational approach generated what is known as economy 2.0, where both types of information are required.

6 Nathalie Joulin, *Les Coulisses des nouveaux produits*, p. 18, Eyrolles, Paris, 2002.

### 1.6.2. *Which role for time?*

Boredom can only really take place, provided that everything, every action has its own temporality. Philosophers such as Heidegger made a distinction between being bored about something and getting bored while doing something. Killing time is not given in a situation, it is rather the situation itself that becomes the means for killing time. A state of alert is characterized by the fact that the notion of time is assimilable to the moment (*kairos*). This differs from clock time (*kronos*), which is defined as specific to the thing. On the other hand, *kairos* is related to *krisis*, the crisis, the decision, that is to say, to the information signal.

In all cases, time is full to such an extent that it disappears in sheer transparency, as Svendsen cleverly pointed out[7]. For him, it is precisely the temporality of daily life, which engenders indifference in the world, and consequently, boredom. Objects are brought closer to men in a strange absence of difference and these objects transmit code-information.

Consultants state that they have observed a new relationship towards time which transforms quantitative time into qualitative time. For them, time is the biggest innovator, in that it elapses and everything happens according to it. Consumers evolve in terms of tastes, mentality and habits[8].

The impression of an acceleration of time, that is to say, of acceleration in the deployment of *kronos*, had led some authors to suggest living more slowly, in a Slow Economy.

### 1.6.3. *Which role for nature?*

As Jean-Paul Demoule[9] observed, the invention of agriculture and livestock introduced a different relationship towards nature.

> "Hunter-gatherers feel immersed in nature. When an animal is about to be killed, the hunter asks for permission from the animal or the animal spirits. When we want to express our

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7 Lars Fr. H. Svendsen, *op. cit.*, p. 182.

8 Nathalie Joulin, *op. cit.*, p. 63 and following pages.

9 We are referring to the book by Jean-Paul Demoule, *Les Dix Millénaires oubliés qui ont fait l'histoire*, Fayard, Paris, 2017.

world view, we also do it through animals, as we can see it in decorated caves. Becoming a breeder implies a radical reversal of this world view, it is like getting away from nature: hunter-gatherers had successfully domesticated the dog from the wolf, but this was rather a win-win type of combination, which was not the case in domestication for meat".[10]

## 1.6.4. *Which role for distraction?*

Distraction is one of the means for fighting boredom. It is also a source of activity in society 5.0.

From a historical point of view, this was the task of royal entertainers. Between 1620 and 1642, the Marquis de Cinq Mars became the entertainer of King Louis XIII, a difficult character to amuse. Having become Grand Squire of France, the Marquis was unhappy to live with a bored man. Indeed, distraction was set at the core of society 5.0 during its development. In Copenhagen, Tivoli was a forerunner in the field of leisure park construction.

Theme parks and tourist attractions are examples of this quest for distraction in society 5.0. This notion brings together a multitude of establishments and places of very different natures and sizes:

– animal parks, like safari-parks, which came after zoos;

– recreational parks, defined as enclosed spaces, devoted to play and entertainment. One of their key elements is the explicit display of a commercial vocation. These are less oriented towards outdoor recreation than a leisure center;

– aquatic-oriented parks, whose operating costs are close to those of a recreational sports pool;

– amusement areas, associated with leisure centers or tourist sites;

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10 Translation of French quote. Quotation extracted from an interview to Jean-Paul Demoule in *Le Monde* newspaper, from October, 29th 2017. Available at the following address: http://www.lemonde.fr/sciences/article/2017/10/29/la-revolution-neolithique-n-a-pas-de-comparaison-dans-l-histoire_5207496_1650684.html# MhqLp4OZTHb SOQCu.99.

– cultural or educational parks, which employ attractions in their museography (robots, train, etc.). These facilities feature a pedagogical vocation, which rather assimilates them with ecomuseums, modern museography having increasingly integrated more playful and recreational techniques.

France offers its public more than 300 parks, but some of these are small and seasonal. Disneyland Paris, Grévin and Futuroscope capture the largest audience. This number greatly exceeds other European countries, which might distinguish France from the rest and be an indicator of its faster entry into society 5.0. There are 89 parks in the UK, 36 in Germany and 27 in Spain.

Boredom is related to thinking and all thinking tends to distance us from the real world. Distraction, on the other hand, disturbs reflection. However, the question of knowing why we become bored does not stem from work or free time. Man can be bored at work, or during his leisure time, commonly assimilated to free time. Entertainment might almost seem preferable to the misery of life, because it provides an appearance of happiness for a moment. Expecting to escape boredom through distractions is like trying to escape from reality. Thus, every pleasure brings no more than a passing satisfaction, reduced to nothing by the appearance of a new need. According to Nathalie Joulin, the individual probably makes a distinction between "labor" time and "leisure" time[11].

In other words, one of the characteristics of society 5.0 is the development of a distraction economy. This economy of entertainment is a real industry.

### 1.6.5. *Which role for identity?*

The current world presents itself as politically correct, smooth, polite[12] (in the moral sense of the word). Thus, for men as for machines, only scars and failures can endow the "body" with its individuality. However, a scar hurts. This is imprinted on ideas as lifetime mark might be.

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11 Nathalie Joulin, *op. cit.*, p. 18.

12 This refers to the extension of politeness to the whole of society, something which is expected from one person interacting with another one, in terms of behavior, manners and a certain language, everything in conformity with the rules of decorum and the respect for correctness.

Anthropology has brought a strong idea to marketing. Consumption is not only utilitarian, to consume is to produce, meaning that it simultaneously displays an individual identity and a social belonging[13]. This notion of identity is crucial for society 5.0. Both men and machines are distinguished by their identity, one of whose elements is the address.

DEFINITION.– An address or an identity is a feature or a group of features whose function is to help locate information (particularly in memory), to identify a recipient or to locate a person or an object.

This notion of identity brings us back to the notions of globalization and regulations.

### 1.6.5.1. *Globalization versus the local level*

Local products are becoming more and more fashionable. Supermarkets like Cora or Intermarché have always had original products from the village, the canton or the region, but this is also the case for highly centralized stores. Casino offers a palette of more than 700 firms referencing crafted or local products.

The difficulty for defining the local level is that this concept cannot be limited solely to food products, for which the consumer seeks freshness, quality, as well as health benefits. The concept of small circuit is currently valued, and the location of the selling point is an important variable. For example, it is not easy to have local apricots in Roubaix. A local product can convey a positive image or pleasure. Its spread may go beyond the limits of its original region. One of the key elements is geography. While *cassoulet* (a typical French dish) is a local offer in Castelnaudary, it is not in Sarthe. A distinction should be made between local products, which provide one or two stores, and regional products, which can meet the needs of ten or more stores. Local supply can be measured in terms of kilometers. This idea is also present in the notion of "smart region".

A "smart region" is defined by S.M.A.R.T objectives, which can be summed up as specific, measurable, accessible, realistic and temporal ones. The second characterization is the definition of equivalent distance circles, most often in terms of commuting time rather than kilometric distances.

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13 Richard Ladwein, *Le Comportement du consommateur et de l'acheteur*, *op. cit*., p. 29.

These distances are grouped in a unified distance matrix (U-matrix) in order to enable further analysis and the definition of equipment policies.

The influence of the local level reflects the importance of the coexistence with nature, which we had already came across in society 1.0 and society 2.0.

### 1.6.5.2. *Globalization, massification and individualization*

As a worldwide process, globalization has sought to produce the same product for everyone. Society 5.0 is characteristic for the adaptation of products to individuals via their identity and/or address. Nathalie Joulin has made the hypothesis that global products are becoming more and more personalized. We even witness the development of regional concepts. We multiply contact points with customers. The author has referred to "operational innovation", in which we find new distribution channels and "advertising innovation"[14]. At an identity level, it is more a question of responding to the consumer's boredom rather than bringing forward real product innovations.

One of the features of society 5.0 is that it distances itself from previous industrialization processes, for example, from the industrial revolution that led to single mass production.

### 1.6.5.3. *Globalization and standards*

Standards are one of the essential elements of this identity, as well as a requirement for this new industry that is being built.

Standards sometimes go through a protocol, for example, a telephone number or an Internet address. Sometimes they are restrictive, as addresses are. The European Article Numbering (EAN) code is a barcode used in commerce and in industry in accordance with EAN International specifications, which associate a code with a product. The same regulation applies to other products: the International Standard Book Number (ISBN) is a unique barcode identifying published books. Some sellers have their own code as well. Thus, the Amazon Standard Identification Number (ASIN)

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14 Nathalie Joulin, *op. cit.*, p. 29 and following pages.

is the identifier for products sold by Amazon. While for books, the ASIN, the EAN and the ISBN are all the same, this correspondence is not necessarily true for other products.

In the case of identity, we are mainly in the domain of code-information.

### 1.6.6. *Which role for alienation?*

Boredom always involves the awareness of being imprisoned in a given situation, or simply in the global condition of the world. We could describe this feeling of confinement as "alienation". Alienation cannot be an ideal, since this presupposes knowing what man is alienated from. Alienation makes it necessary to make an explicit reference to another element, the object of alienation. This will probably be the element which has been lost or the one which remained attached to man.

For Bertrand Vergely, alienation characterizes the situation of becoming a stranger to oneself. This situation concerns a human being who has the impression of not being who he really is, despite the fact that he has not lost what constitutes his everyday existence[15].

According to Svendsen, boredom has a dehumanizing effect, which is itself a form of alienation. It removes meaning from man's life, precisely that which constitutes life as such[16]. Man's being might be constituted by the fact of being in the world, that is to say, in virtue of the polarity between subjects and objects, in other words, between man and his surroundings. The same author asserts that, when bored, we experience "the inexistence of reality or the reality of non-existence". Nowadays, this argument is used by medical professionals to fight against the emergence of medical technologies.

Alienation, and particularly technological alienation, is frequently put forward by those who oppose society 5.0, mainly because the former type of society is still profitable for them.

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15 Bertrand Vergely, *Petite philosophie pour jours tristes*, p. 76, Milan, Toulouse, 2003.
16 Lars Fr. H. Svendsen, *op. cit.*, p. 184.

### 1.6.7. *Which role for action?*

The question of action is important in society 5.0 because power is no longer derived from the possession of information, but stems from the ability to act. This is the reason why the transition from a bored consumer to an acting consumer is so important.

In his earliest work, Pascal showed an interest in boredom. In *Thoughts*, he wrote:

> "Nothing is so insufferable to man as to be completely at rest, without passions, without business, without diversion, without study. He then feels his nothingness, his forlornness, his insufficiency, his dependence, his weakness, his emptiness. There will immediately arise from the depth of his heart weariness, gloom, sadness, fretfulness, vexation, despair".

According to Alfred de Vigny, the other remedy against boredom was action, which derived from readiness. In his famous speech at the Chamber of Deputies in 1839, Alphonse de Lamartine reckoned that "France was bored" and that is why it was necessary to have a will to act.

Alain Caillé was interested in the theory of action by Didier Mauss. This theory is structured according to four motivations, organized in two opposite pairs. As regards the first pair, the actor pursues his individual interest, which we can describe as self-centered, seeking personal glory, recognition, and eventually, to please others. These are all free things that cannot exist without the counterpart of a partner, of another one. The teenager's new pair of sneakers with transparent or luminous soles only makes sense provided that other teenagers envy him for these. It naturally follows that he must quickly find another model so as to reinitiate the process.

The second pair of opposites is described by Caillé and Mauss: every action entails an obligatory character related to regulations and social rules. These laws and regulations are opposed to spontaneity, to pleasure and, therefore, to a certain degree of freedom.

In society 5.0, acting becomes a source of happiness, pleasure and freedom.

## 1.7. The contribution of the first revolution

Jean-Paul Demoule[17] has stated that the invention of agriculture and livestock signified an unparalleled revolution for humanity. The specialized teachings of this period can help us understand the ways in which society 5.0 can be implemented.

Relinquishing the world of hunting and gathering, man was able to take control of a certain number of animals and plants. This represented the invention of agriculture and breeding. In a similar way to the changes which are starting to take place in society 5.0, the agrarian revolution made sedentariness possible. This influenced both mobility and habitat, as it will also happen in the new society. The revolution also caused a demographic boom. As Jean-Paul Demoule pointed out, on average, hunter-gatherers had a baby every three or four years, while women farmers had a baby every year, even if some of the children died at a young age. For this author, the following revolutions had the same consequences. In the context of society 5.0, one of the important issues will be the impact of population growth.

## 1.8. Humanity 2.0 and society 5.0

In 2005, engineer Raymond Kurzweil published his book *The Singularity Is Near*[18]. In this book, he claimed that, in 40 years, that is to say, in 2045, artificial intelligence would prevail over man. He named this approach "technological singularity".

DEFINITION. In social sciences, singularity is a concept that the American science-fiction writers of the 1950s borrowed from mathematics. It refers to an unprecedented and irreversible global mutation.

According to Ray Kurzweil, networking supercomputers and their software will increasingly become more "intelligent", and end up performing better than humans in all areas. This might signal the advent of humanity 2.0.

17 This is the book by Jean-Paul Demoule, *Les Dix Millénaires oubliés qui ont fait l'histoire*, *op. cit.* The author is an archeologist and a distinguished professor at the University of Paris I Panthéon-Sorbonne. He specializes in the Neolithic period and the Iron Age. He was also the President of the INRAP (the French National Institute for Preventive Archeology Research) from its creation in 2002 until 2008.

18 We are referring to the book by Ray Kurzweil, *The Singularity Is Near*, published in French in 2005 as *Humanité 2.0*, M21Éditions, Paris, 2007.

Humanity 2.0 will feature a fusion between man and machine. For this, Ray Kurzweil suggested a step-by-step advancement, which will combine the science and technology of society 5.0: consequences of research on genetics, generalization of nanotechnology and the use of automation and robotics. According to the author, the process will logically start in an unapparent manner: cellular therapies for the treatment of diseases, implantation of electronic chips for analysis and biological follow up, bodily introduction of repairing nanorobots (particularly in the blood stream) and connection of intelligent orthotics and prostheses. From this will follow a "slow but inexorable progression of biological humans towards non-biology". For Kurzweil, even before the change of singularity, "improved humans" will exist. The author even suggested the hypothesis of immortality. With these changes, humans might be able to live well beyond current averages. Our book will analyze the strengths and weaknesses of these technologies.

## 1.9. The new role of society 5.0: a return to bio?

As society 5.0 has resumed with the codes of the ancient society in its coexistence with nature, it features a "return to bio", that is to say, to organic vegetables, but also to biomedicine, biodegradable plastics, etc. This return to bio is not an ecological doctrine, but it is related to society 5.0 and features significant economic effects.

Bio also refers to biodiversity. This notion is very broad: biodiversity is devoted to the diversity of the living world at all levels: diversity of environments (ecosystems), diversity of species, genetic diversity within the same species, but also the presence of diversity in human and animal actions.

## 1.10. Growing sectors and lagging sectors

The dynamics of society 5.0 partly stems from economy.

DEFINITION. Cost of Entry (CoE) is a term used for describing the cost of entry of a brand or a firm into a new market: it is related to physical and marketing (advertising, distribution) investment.

Two types of economies are leading the Internet:

– the relocation of traditional industrial economies, particularly with technologies such as 3D printers, technologies that make it possible to reduce the technological entry ticket; relocation is accompanied by huge gains in industrial competitiveness;

– a social and a solidarity economy, related to a "Co" society, which is gradually transforming non-commercial ventures into commercial ones. In this case, we are referring to the marketing entry ticket. We will discuss the concept of "Co" society later on.

## 1.11. The elements of society 5.0

Adaptability, agility, mobility and reactivity are now key words in the life of society 5.0, which entails the fact that mutations, changes and evolution are an observable constant on a daily basis, which is also reflected by infrastructure, knowledge and skills.

Adaptability, agility and reactivity are very important and require the implementation of industry 4.0, using additive techniques that consume fewer resources for production. The next chapter will be devoted to this new type of industry. Mobility produces effects in transportation and at home, which are increasingly becoming more "mobile" and more intelligent.

Society 5.0 is a fresh "New World" in which the exchange is important. This concept questions the primacy of economic exchanges and the primacy of ideas.

In Western democracies, since it was goods exchange that prevailed, the performance of means of transportation must have favored globalization. However, in society 5.0, it is the primacy of ideas and knowledge that take precedence. Around 1992, China developed its soft power, the primacy of ideas. France is another example, as reflected by its "cultural exception". Exporting ideas and knowledge have become a source of wealth in a period when goods exports are declining, and service exports are increasing.

The creation of company values does not refer so much to the exploitation and transformation of natural resources, but rather to the use

of infrastructure (including transport[19] or telecommunications networks), on the one hand, and knowledge and skills, on the other hand. Infrastructure, knowledge and skills are key resources that need to be managed and which will create the competitive edge that will favor organizational development. As a consequence, some questions arise:

QUESTIONS.

– How do we know which types of infrastructure, knowledge and skills are needed for the organization?

– Which management tools should be implemented in order to manage it?

– Which different types of management and enterprise structure should be implemented?

– What are the challenges the organizations will have to face?

– How will the management of infrastructure, knowledge and skills change collective action?

Our book will seek to answer these questions.

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19 This notion refers not only to routes, railways, ports, etc., but also to gas or water networks, etc.